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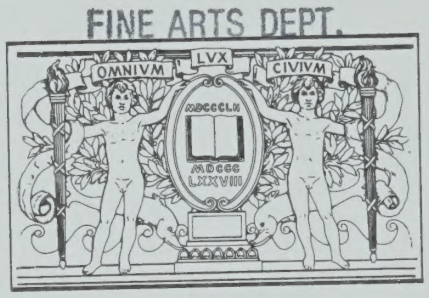

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SCIENTIFIC AMERICAN.

Building Edition.

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1899

A RESIDENCE AT NEW HAVEN, CONN.

Nº 159. JANUARY, 1899.

B. P. L.
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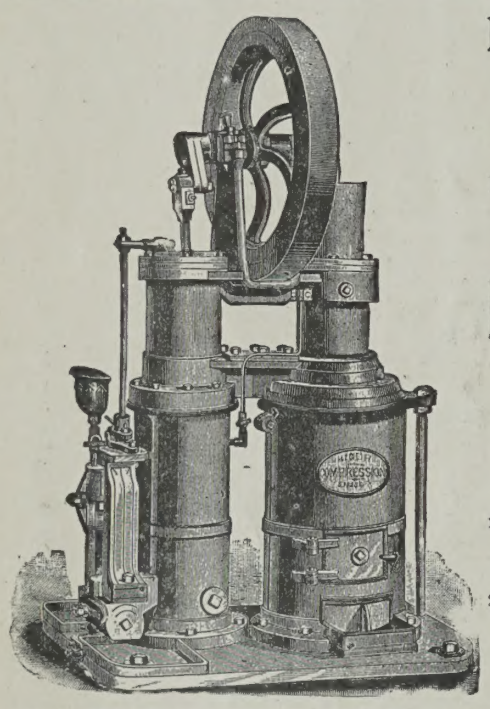

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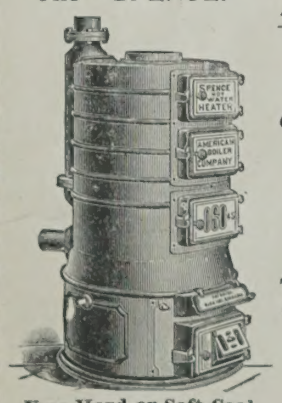

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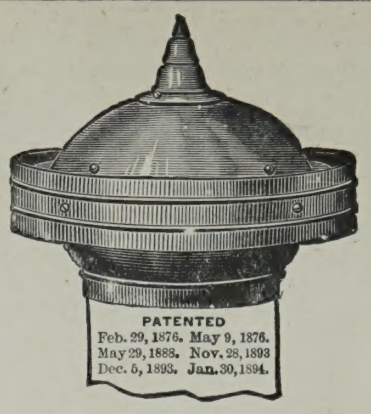

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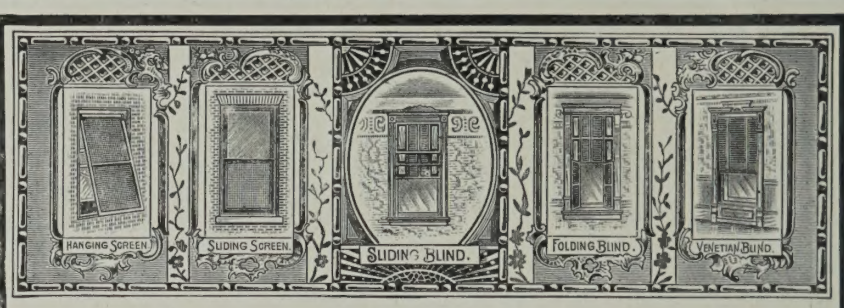

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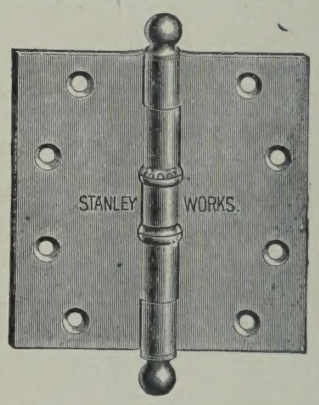

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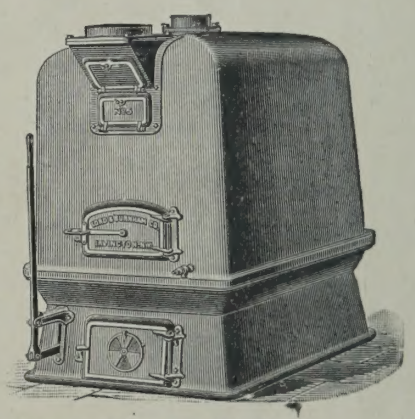

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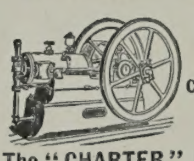

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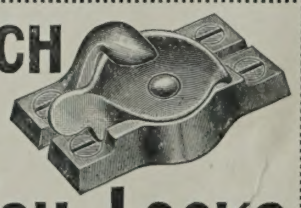

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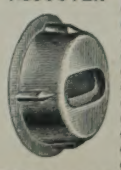

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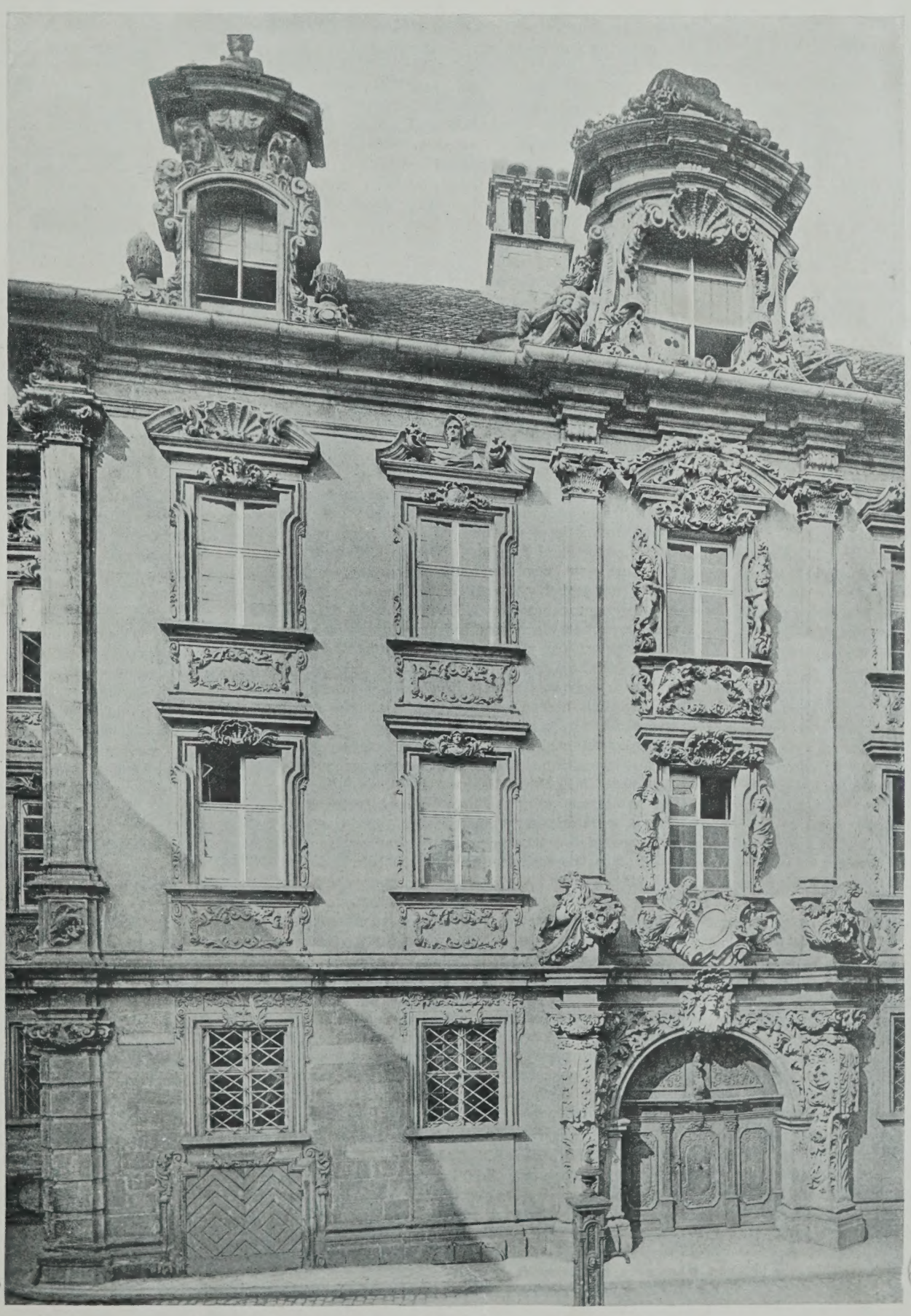

AN OLD DWELLING IN BAMBERG, GERMANY.—See page 16.

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NEW YORK, JANUARY, 1899.

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SANITARY MISTAKES OF SMALL TOWNS.

The agitation concerning good drinking water has reached the small towns, and almost all of them are seeking for a new supply to supplant the time-honored well. The subject of drinking water and sewers in small towns is an important one. Owing to the fact that it is both difficult and expensive to furnish a small plant for either a water supply or sewage, or both, it is necessary for those in authority to proceed with great deliberation in order to avoid costly mistakes which a small town can ill afford to bear. The subject is fully treated, in a recent number of Sanitarian, by Dr. Harvey Bashore. For some reason or other people have gotten the idea that spring water, no matter from where it comes, is a desirable thing, and if the spring has a source high enough to permit of obtaining water by gravity without costly pumping works, it is considered an ideal supply; so that often a few of the prominent citizens of a town get together, buy land, lay pipes, and soon are in a position to proclaim that their town has an adequate supply of pure mountain spring water—the best in the land. Now, the fact is that spring water is no better, nor even as good as some other water. Dr. Bashore recently made an examination of a sample of Croton water taken from the New York mains and a sample of spring water from some Pennsylvania hamlets, and the result was considerably in favor of Croton water. A spring is even no better than a well, except that it is often situated in an uncultivated upland. If it is in a town surrounded by dwellings, it is even worse than a well, on account of its being so readily polluted by surface washings. Another point worth remembering is that, when these towns have procured a water supply which is presumably pure, it is expected to be maintained without attention or expense, but this is a fatal mistake. The price of a pure water supply is eternal vigilance. There is a small town near Harrisburg, Pa., which recently tapped a fine spring in the mountain; originally it was a pure spring, but the town which used the water exercised no care over the ground, and as a result cows from neighboring pastures wallow in the spring. Of course, this does not necessarily breed disease, but it demonstrates, at least, that this community is not getting as pure water as it imagines.

Another difficulty is liable to arise in small towns. Some of the richer citizens think they should have water closets and bathtubs, and soon the services of a plumber are required. Then comes the question what to do with the sewage, for sewage it will be. This rarely troubles a householder. He says this will run into the sewer; but unfortunately in many cases there are no sewers, and the wise plumber helps him out of the difficulty by running the soil pipe into the old privy, and tells him if the privy gets full he can have it emptied. In the majority of cases it will never get full, for the simple reason that most of the water will leak into the surrounding soil. This would not be of very great importance if only one or two of the inhabitants had water closets; but other citizens do the same, and soon all of the privies in the neighborhood are turned into cesspools, and as time passes on there are cesspools everywhere, and as they all leak into the ground the water soon becomes poisoned, and those who still obtain the water supply from wells must, of necessity, drink contaminated water.

Water pipes also nearly always leak, and whenever the pressure from without becomes greater than that in the pipes—which it most frequently does—filthy soil water passes into the pipes. The town water supply becomes polluted, and eventually there is an epidemic of typhoid fever. As time passes on the town increases in size, still retaining its primitive sanitary appliances, and consequently we are treated with the sight of towns of 6,000 to 10,000 inhabitants using cesspools. We have in mind one of the handsomest towns in New Jersey, filled with beautiful houses, which are frequently reproduced in our pages, and which up to a few years ago had about 10,000 inhabitants depending entirely upon cesspools for the care of sewage, notwithstanding the fact that it is situated on a considerable elevation, giving an ideal chance for gravity sewerage. In the last few years an expensive system of sewerage has been installed, but it is curious to note what large sums of money are spent in building fine roads and laying out parks, while the vital question of sewerage is untouched.

Sooner or later all cesspool towns will have an epidemic of some disease, usually typhoid, which is directly attributable to cesspools. The cesspools will then give place to good sewage, but the damage will have been done, and many lives will be lost, and much sickness endured, all because we want to patch mediæval shiftlessness onto nineteenth century progress.

LANDSCAPE GARDENING.

Years ago, when a man wished a country house built, he engaged the services of an architect, told him how many rooms he wished and the amount of money he was willing to spend. The architect then drew up the plans, and after the house was built the grounds were beautified according to the taste of the owner. In the majority of cases the result was bad. This system, or rather this lack of system, still prevails, but a change for the better is now going on, and in a few years the employment of a landscape gardener will be considered as absolutely essential as the services of the architect are now. Some architects who, by reason of fortune or their success, can be independent, refuse nowadays to undertake the plans of a country house unless they also have control of the landscape work about the house. Their point is well taken, for the style of architecture which a competent architect would employ must be chosen with a view to the natural setting of the grounds, but after that is done artificial effect must be given to the rounding out and perfecting the lines of the house. When this is properly done the landscape and house seem indissolubly bound together, so that the landscape is really a part of the house as much as the house is of the landscape. The landscape architect has many things to consider. Not only must he take into consideration the vistas seen from various points of the house, but the views of the house itself, from different points of vantage, must be carefully attended to.

Landscape art is one of the products of our advanced civilization, and requires a subtle artistic sense, and in a few years more the subject will be even better appreciated than it is at present. We have already referred to the competition for the California University. This has given great impetus to landscape gardening, although in this case probably "architectural landscape" would be a more proper term to use. The first step for the competition was not for elevations, as is usually the case, but for complete surface plans of the buildings and grounds. Some of the best architects in America were consulted, and no expense was spared in obtaining the most satisfactory plans, and an international jury was arranged for and a decision was finally reached at Antwerp, and eleven architects have been selected to take part in the final competition. All the successful architects had studied at the École des Beaux-Arts, where landscape art is taught as an essential element of architectural design. This is probably the first instance in America of the importance of the landscape as a vital and inseparable adjunct to the architectural scheme being recognized, but after public taste is still further developed public enterprises will also be cultivated, so that we will have more artistic squares and parks than at present. Large cities, however, have for many years had the services of landscape architects, but many of them were laid out so long ago that they hardly come up to the prevailing taste of the day. Many of the foreign schools of landscape gardening devote a large part of their attention to gardening and forestry in its natural sense, such as the planting and rearing of trees, treatment of flowers, placing of rocks, etc.; but for a landscape architect of the highest type a thorough knowledge of architecture is absolutely indispensable.

MODEL FOR A STATE FLAGSTAFF BASE.

The Municipal Art Society, whose rather Utopian object is to beautify the city of New York, finds nothing æsthetic in the present arrangement of the flagstaff on top of City Hall cupola. With a view to obtaining an artistic design for a bronze base for a standard, some months ago they instituted a competition for such designs. The conditions of the competition called for a model whose decorations would be suitable to the place, and calculated for a height of not more than fifteen feet, and to cost, when cast in bronze, not more than $3,000. For this purpose the society offered $700 in prizes, and a committee of fifteen architects and sculptors has awarded the first prize of $400 to the design submitted by Palmer & Hornbostel, architects, and Charles A. Lopez, sculptor. The model shows the column in Louis XVI. style rising from an octagonal base. On the foot of the column are inscribed the names of the five boroughs of the city of New York. Before these are four shields on which are illustrated the events in the history of the city, and surrounding the shields are four heads, representing an Indian, Hendrik Hudson, Peter Stuyvesant, and De Witt Clinton. The shaft of the column represents a banner wound around a pillar. There are thirteen grooves on the column and forty-five stars at the top. The upper part ends in a wreath of evergreens. It is proposed to have a full-sized model made from this design out of plaster. This will be set up in front of City Hall in the place where it is intended to go, so that all may judge of the effect. This is a system that is largely used in France, and sometimes plaster groups which are masterpieces will be left in a public square for weeks in order that they may be seen and criticised. The Municipal Art Society does not intend to present the bronze standard to the city, but hopes the effect made by the model will be such as to bring forward some donor who will be willing to furnish the necessary $3,000 for its erection. It is very satisfactory to note this change in the Municipal Art Society. The membership is not large enough to warrant the presentation of works of art to the city, but the society will do notable work if each year they can have one or more competitions for some such ornament as the flagstaff holder. This is much better than presenting a single work of art to the city once every four or five years.

PRIVACY OF SUBURBAN LIFE.

A few years ago Mr. L. Clipston Sturgis, the architect, writing in the "Cosmopolitan," gave some interesting considerations regarding the privacy of suburban life. He said more individuality and more seclusion should be achieved in the arrangement and planting of grounds about suburban houses of the better classes than is usually obtained and even desired in America to-day. The article goes on to say that the lives led by owners of such houses should be more individual, more private, more truly domestic, and more closely in touch with nature, and that this cannot be accomplished unless the character of their environments is changed. There is no necessity of preaching the gospel of privacy and seclusion in England, where habits of suburban life render it unnecessary, and indeed they even go to the other extreme, and they shut off their houses from the road in a churlish manner. There is an air of comfort and quiet dignity in the respectable and homelike suburban house in England. Our own houses are usually frame houses, and often they have a look of newness and rawness, and sometimes even look unsubstantial and temporary. In a large number of cases they have no suggestion of dignity and retirement: they look hospitable and open; they invite you to look in on their grounds and through the open windows, where the English house says, "Don't come in unless you know us." As long as economy must be a ruling feature, the American will probably build with wood, which is admirably adapted to our climate. A house properly constructed can be given a look of permanance and stability which will compare with that of an English house. To do this, however, it will be necessary to prefer quietness to showiness, harmony to variety, and simplicity to overelaboration. The outer aspect of the house is not necessarily an indication of the character of the owner. Many who build houses are entirely unacquainted with architecture in even its simplest forms, so that the advice of an architect or builder is often followed in its entirety. In a majority of cases the result is highly satisfactory, while in others the results are not so successful. The interior of the house, however, is apt to have something of the character and habits of the owner. They are influenced to some extent by the disposition of the interior. It is impossible to lead a comfortable and domestic life in a house that has been planned and constructed for show. Many American houses have been built rather as places which may be acceptable to visitors, or where troops of guests may be sumptuously entertained, than a place in which to pass away personal existence. The character of the life led in the suburban house is determined, for at least seven or eight months of the year, very largely by the character of its grounds. If the grounds are not beautiful the sense of beauty will be dulled and distorted, and if the grounds are adapted to outdoor living they must have a good measure of privacy and seclusion. The English suburban place fosters not only the typical English love of nature, but the typical English form of domestic life, which is reserved, intimate, and thoroughly domestic, yet hospitable in the truest sense of the word, because the greatest hospitality is that which admits the outsider into the inner circle of the home. Quite different from this is the current American idea of beauty, comfort, and convenience, as expressed in suburban homes.

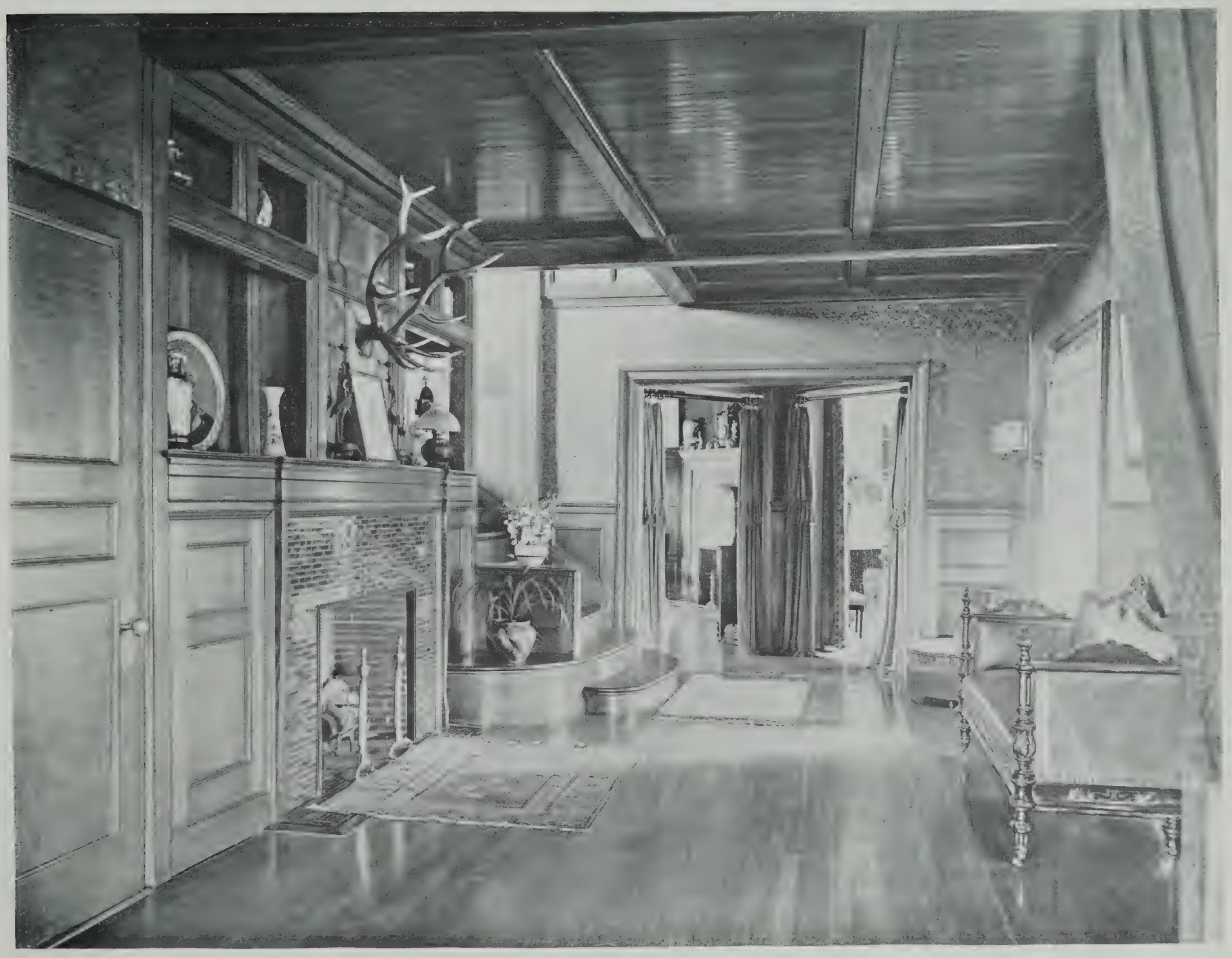
In colonial days English ideals were approached, as is shown by the streets which still exist in towns like Salem

and Annapolis. As a rule, the English house is set back from the road, while the American house is set upon it or very near it. The privacy for the grounds is achieved in both cases. In England they are protected from the street by high walls and hedges, but in colonial times the grounds were placed at the back of the house, and were overlooked by the windows of the chief apartments. After colonial days we more frequently set our houses back from the street without giving them the protection of high inclosure, but until within a few years they were separated, and in general effect, to some degree, secluded by walls and hedges or palings of moderate height and by screening plantations. It still looked like a home, even though it gave evidence that its owner loved entire seclusion less than their English cousins, but in recent years, however, there has been a widespread desire to abolish the last semblance of privacy. In countless old towns and villages the barriers have been destroyed and each man's garden merges in his neighbor's, while all merge indistinguishably in the grassy border of the street. In many new streets the most admired type of place seems to be the one where there is an abundance of well-kept grass and an overabundance of graveled drives and walks.

A RESIDENCE AT YONKERS, NEW YORK.

We show above and on pages 4 and 5 a residence erected for John Kendrick Bangs, Esq., at Yonkers, New York. The engravings present a design of unusual beauty in its treatment, and it combines both excellent exterior elevations, and an interior conveniently arranged, and finished off in a most artistic manner. The exterior elevations, though square rigged in outline, are sufficiently broken by numerous bay windows, dormers, and a spacious piazza, to give the whole a pleasing effect. The chimneys, with their ornamental ironwork fixtures, are a feature in themselves. The underpinning is built of local rock-faced granite, of Irish-gray color. The superstructure throughout is of wood, and is covered with sheathing, paper, and then cedar shingles, stained a dull slate color. The trimmings are painted in harmony with the body color. The roof is also covered with shingles. Dimensions: Front, 56 ft.; side, 35 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The hall is trimmed with quartered oak. It has a paneled wainscoting, four feet in height, above which the wall is covered with lincrusta walton. The ceiling is heavily beamed, forming deep panels, which are filled in with narrow beaded oak. The fireplace is built in a unique manner, with paneled work, tiled facings and hearth, and wrought iron trimmings. The staircase is an ornamental one, rising up to morning or music room. The color scheme in the hall is of a greenish feeling. The parlor or reception-room is treated in the colonial style, white and gold, and is circular in form, at one end of room, with excellent effect. It contains an open fireplace, with white enameled tiles and brass trimmings. The mantel is treated and designed in a handsome manner. The library is trimmed with quartered oak, and the room is lined with bookcases, which form a wainscoting. The walls above these bookcases are of rough plaster, and are treated in a sea-green color. At the rear end of room is a tee-square bookcase, behind which is Mr. Bangs' work table and desk. This part of the room is separated by an elliptic archway, sweeping gracefully from pilaster to pilaster and isolating this end of the room. At the south side of room are some very excellent stained-glass windows, by Armstrong, representing the very earliest painters; one representing Caxton, and the other Simon Vostré. The fireplace is constructed of terra-cotta and mosaic. The chimney breast contains a panel, representing a group of horses of the Pantheon order. The dining-room is trimmed with cherry, and it has a wainscoting of panels to a height of seven feet, with a core ceiling above same. The space between wainscoting and core is covered with tapestry paper. The open fireplace is built of brick, with tiled facings and hearth, and mantel of cherry. The butler's pantry and rear hall are conveniently located, are trimmed with ash, and the former is furnished with the best improved fixtures, cupboards, closets, dressers, etc. The piazza, at the rear, 56 feet long and 14 feet in depth, is reached from the rear hall, and from the two bay windows, which are provided with French windows, running down to floor. This piazza is provided with movable sash, and is in reality another room added to the house. The music-room, which is reached from the main staircase, is trimmed with quartered oak, and its ceiling is 12 feet in height, with a paneled wainscoting, six feet in height. The second floor contains five bedrooms and numerous large closets. The bedroom over the parlor is trimmed with cherry, the one at front, over the library, with ash, the one at rear with oak, and the rest in ash. The large room over the dining-room is used as a nursery, and it has a nook with fireplace. The bathroom is wainscoted with oak, and it has porcelain fixtures and exposed plumbing, all nickelplated. The third floor contains three servant bedrooms and two trunk-rooms. The basement, or cellar, contains a billiard-room, the kitchen, etc.; laundry, cold storage, coal, and furnace cellars. Mr. Henry Rutgers Marshall, architect, No. 3 West 29th Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

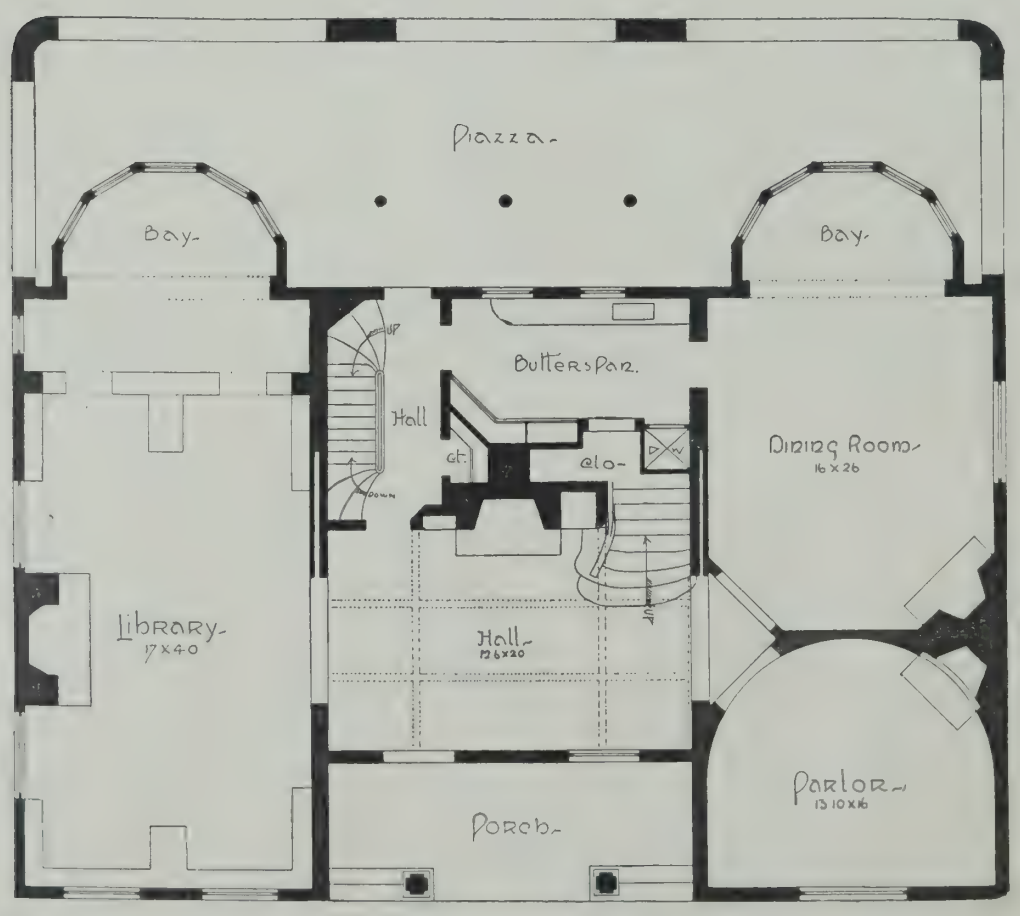


HALL IN A RESIDENCE AT YONKERS, N. Y.

A RESIDENCE AT NEW HAVEN, CONN.

We present as our subject for colors, and on pages 8 and 9, in this issue, an attractive and unique residence, which has been recently completed for W. C. Sturgis, Esq., at Prospect Avenue, New Haven, Conn. The engravings present a design which is admirable and unusual in its treatment. The detail is of the colonial style. The general exterior effect and plan show an arrangement for a rambling house. The front entrance is provided with colonial columns at either side of entrance, painted dark olive green. The exterior walls are covered with stucco work, plaster of a creamish yellow color, with white trimmings, and bottle-green blinds. The roof is shingled and finished natural. Dimensions: Front, 70 ft.; side, 33 ft., not including piazza. Height of ceilings: Cellar, 8 ft. 6 in.; first floor, 10 ft.; second, 9 ft. The interior throughout is trimmed with white-wood. The vestibule has a tiled floor, and a closet at one side and a toilet on the other side. The main hall is treated with ivory white, and it has an ornamental staircase, with spindle balusters and newel. The piazza at the rear of hall is inclosed in winter, and is used as a conservatory and breakfast-room. The drawing-room is treated in cream white. It has a paneled seat in bay window, and an open fireplace, with a dull-green tiled hearth, Persian tiled facings of unusual beauty and design, and a mantel made from special order. The library, or study, is finished effectively in oak green. The fireplace is built of Portland stone, handsomely carved, and it has a mantelshelf. This room also con-

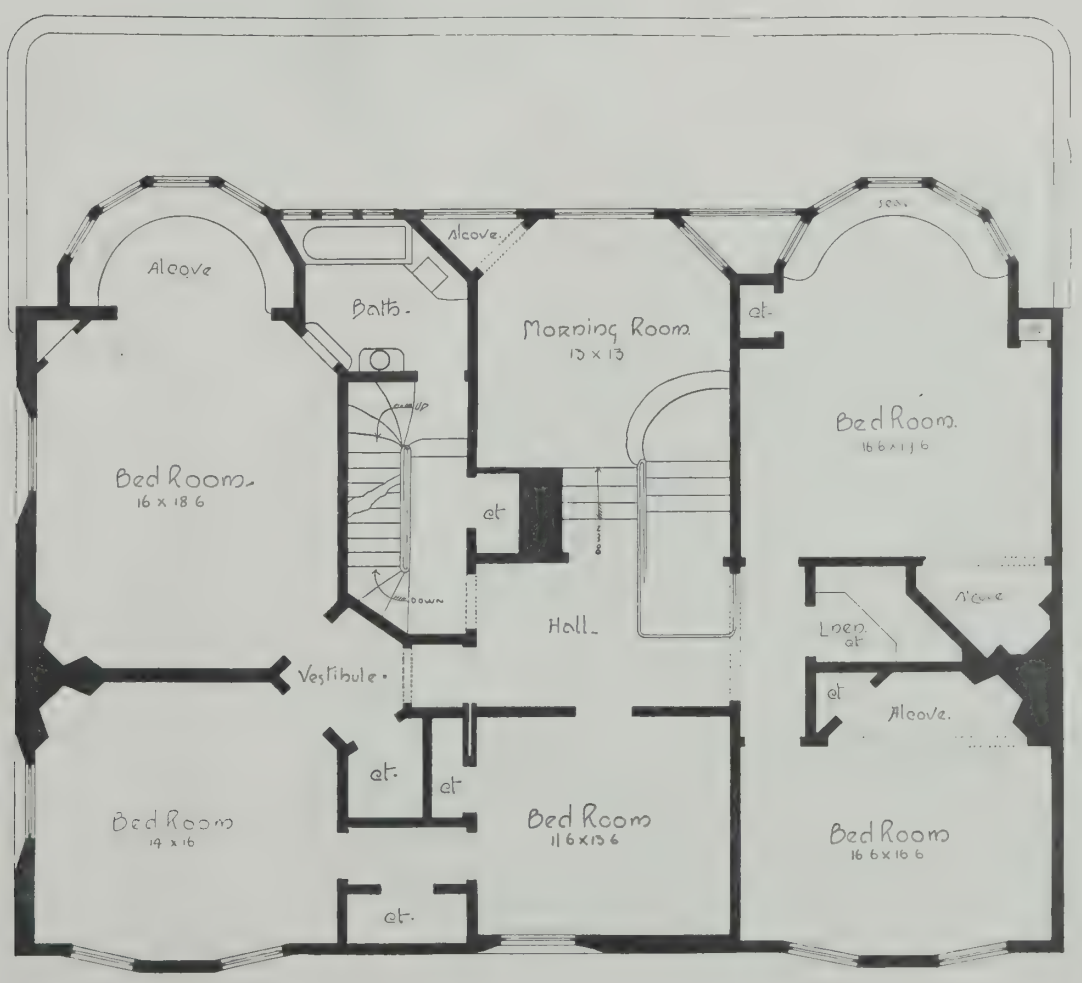
(Continued on page 16.)



First Floor.

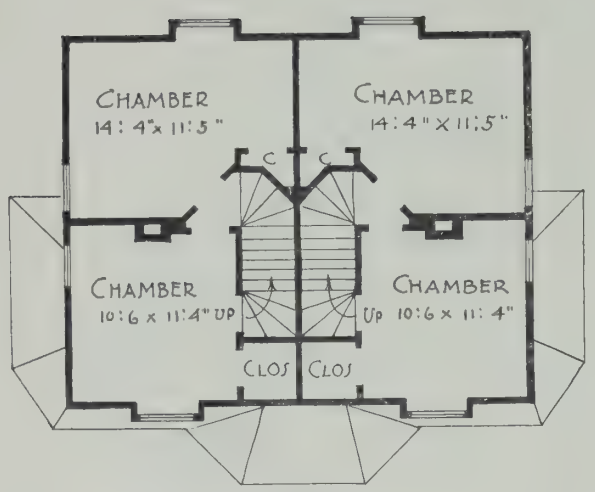
A RESIDENCE AT YONKERS, N. Y.—See page 3.

MR. HENRY RUTGERS MARSHALL, ARCHITECT.



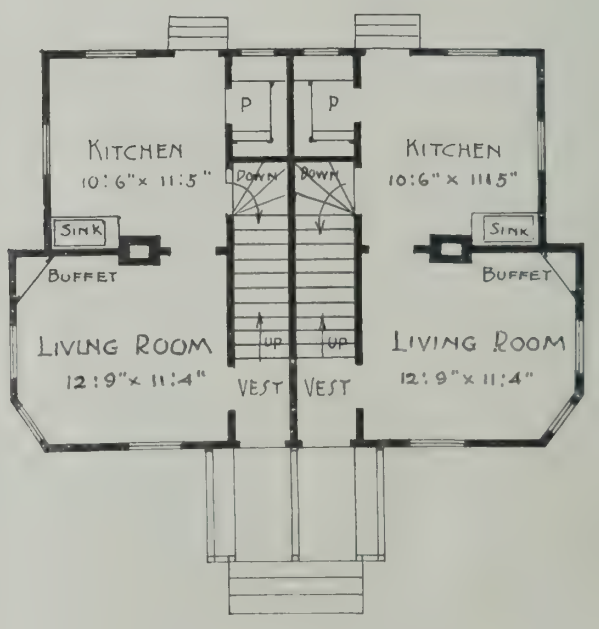
A RESIDENCE AT YONKERS, N. Y.—See page 3.

MR. HENRY RUTGERS MARSHALL, ARCHITECT.



SECOND FLOOR PLAN

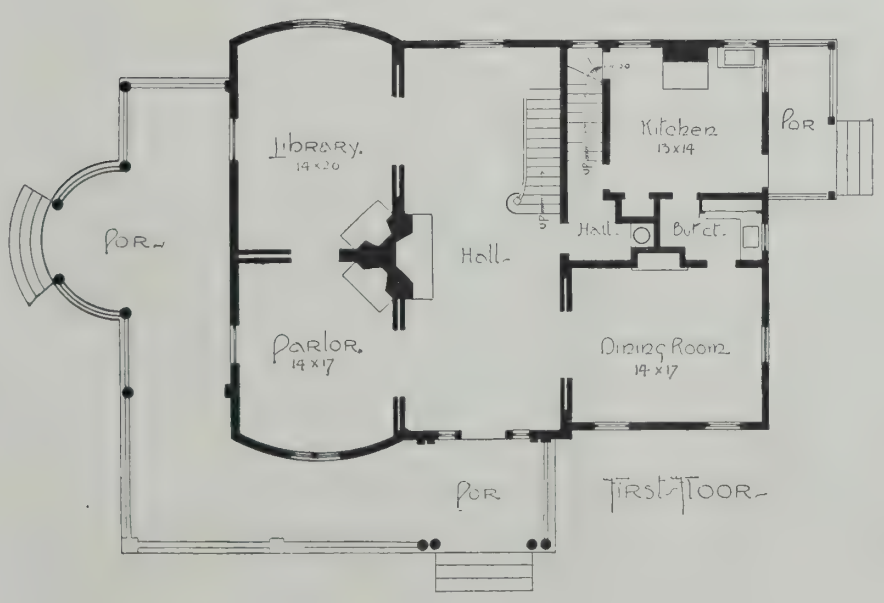
THE LIVING ROOM

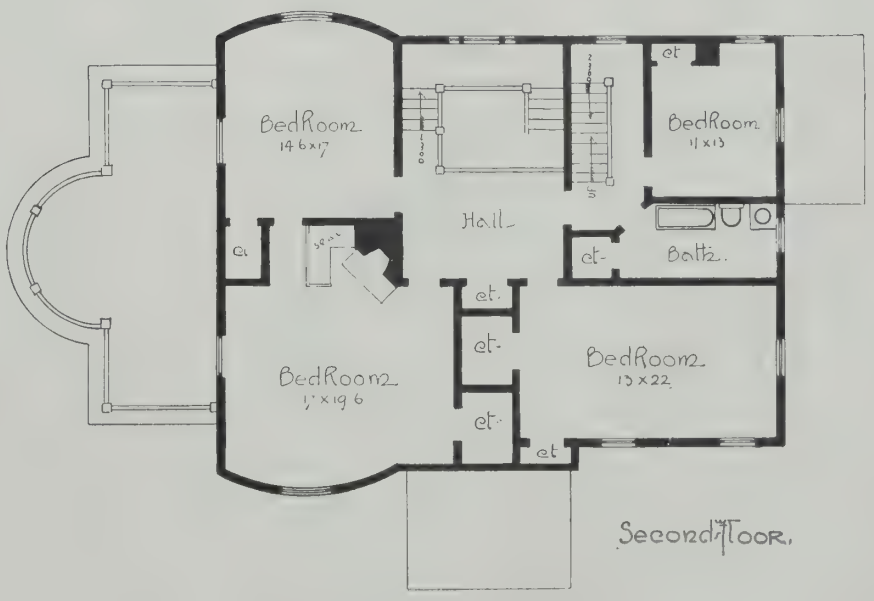


FIRST FLOOR PLAN

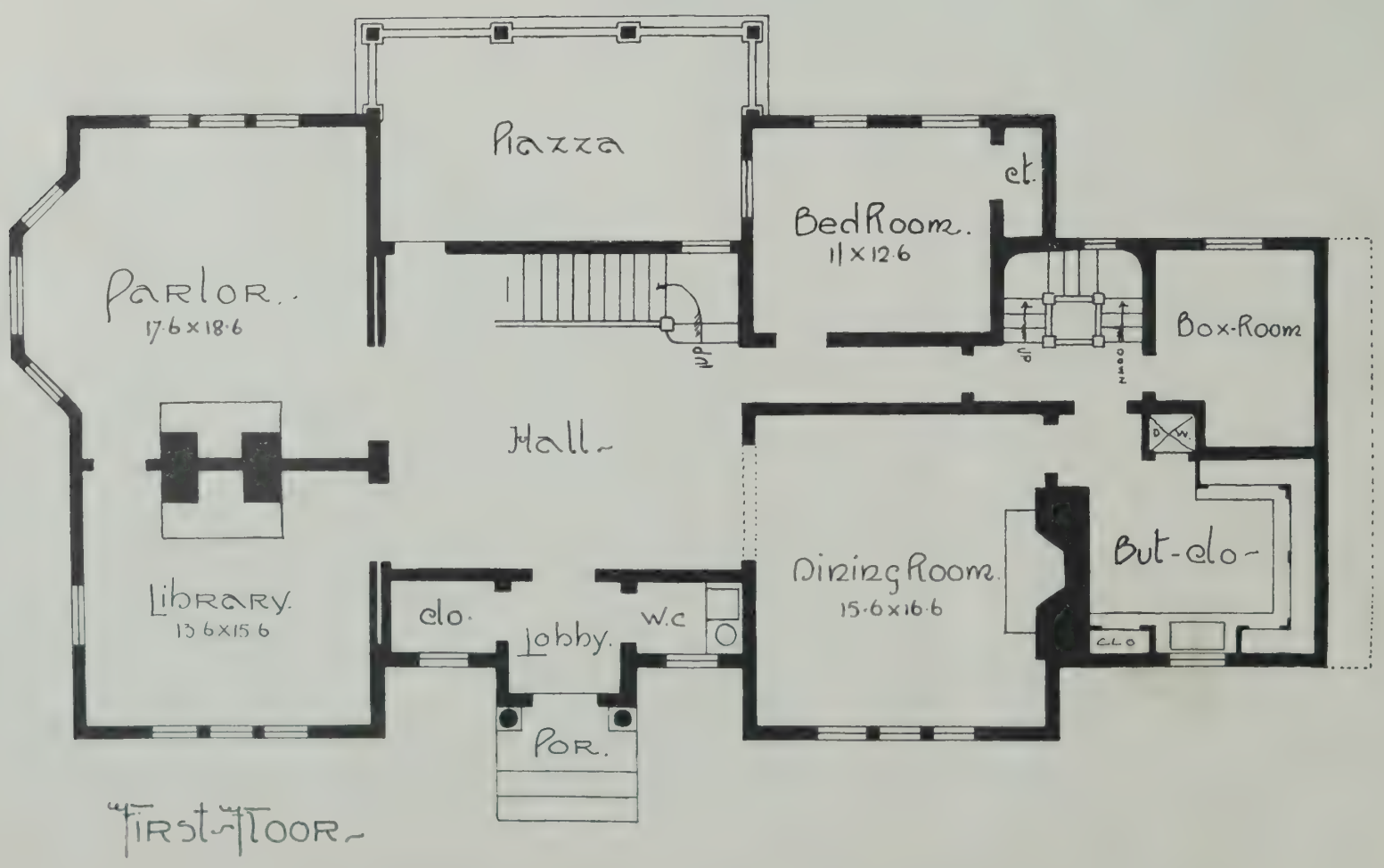
A DOUBLE HOUSE FOR SMALL FAMILIES AT STONEHAM, MASS.—See page 17.

MR. E. R. B. CHAPMAN, ARCHITECT.



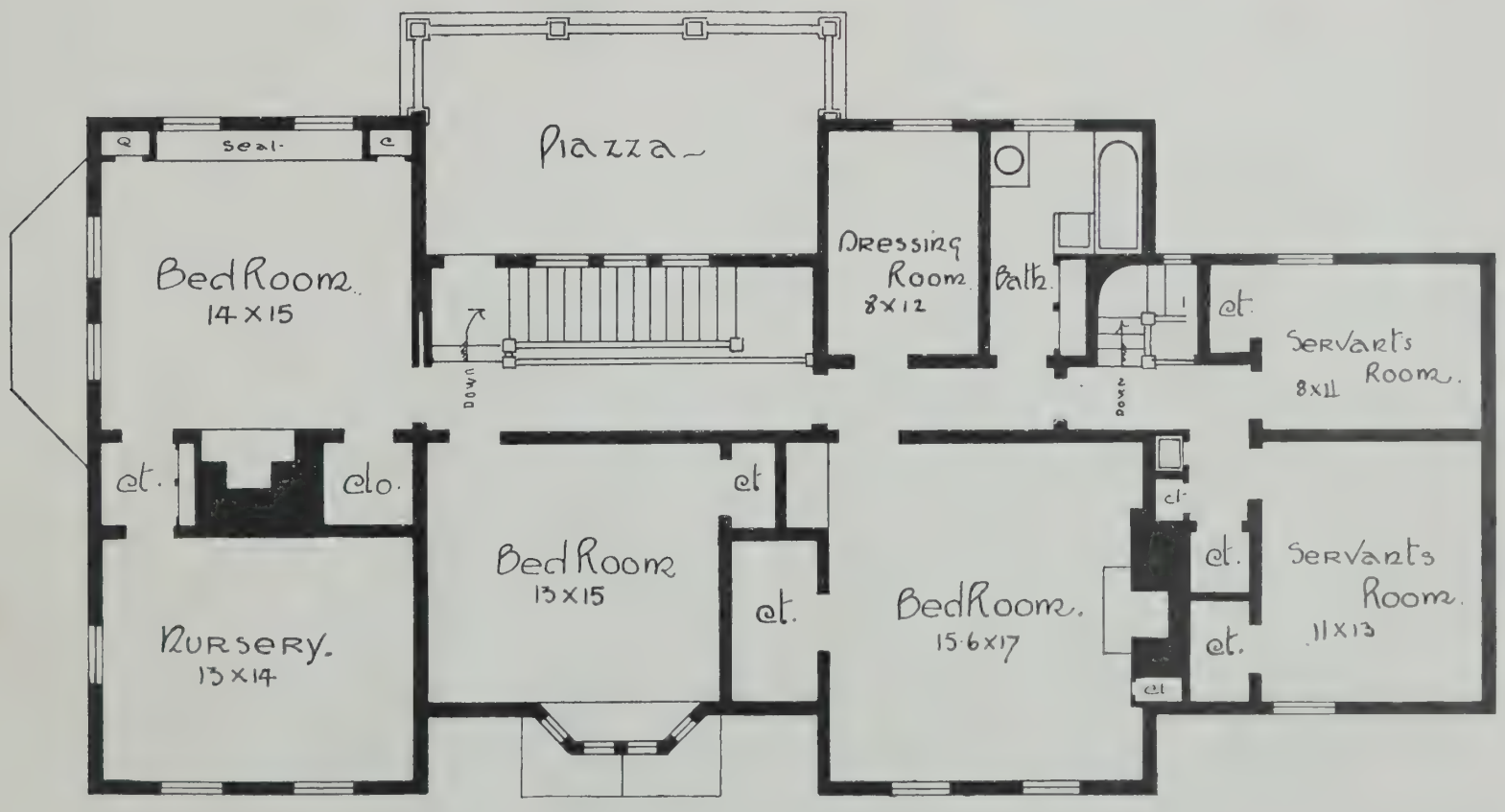


A COLONIAL RESIDENCE AT BENSONHURST, LONG ISLAND.—See page 16.



A RESIDENCE AT NEW HAVEN, CONN.—See page 3.

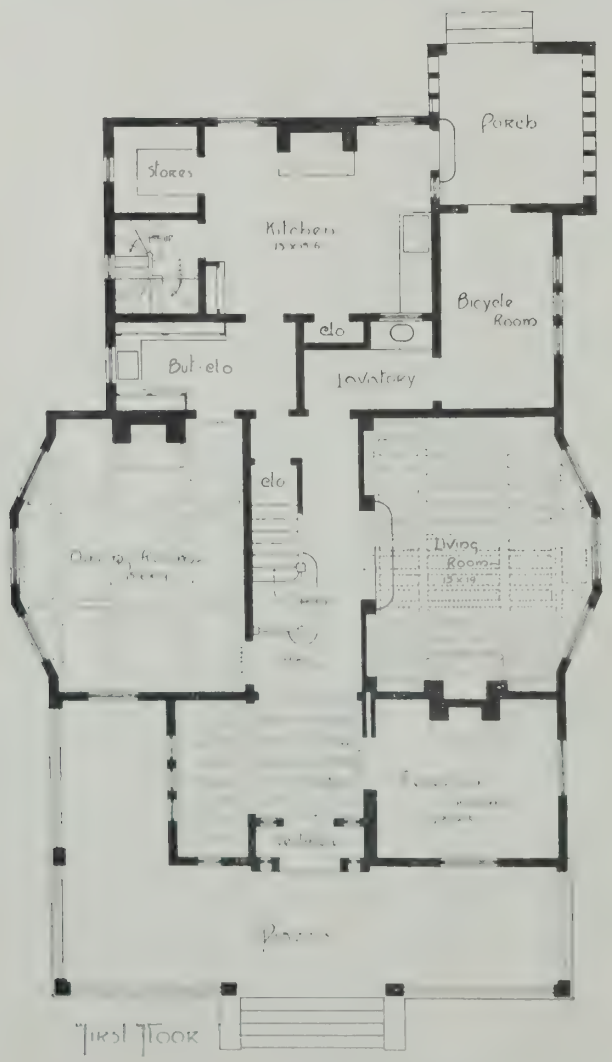
MR. R. CLIPSTON STURGIS, ARCHITECT.

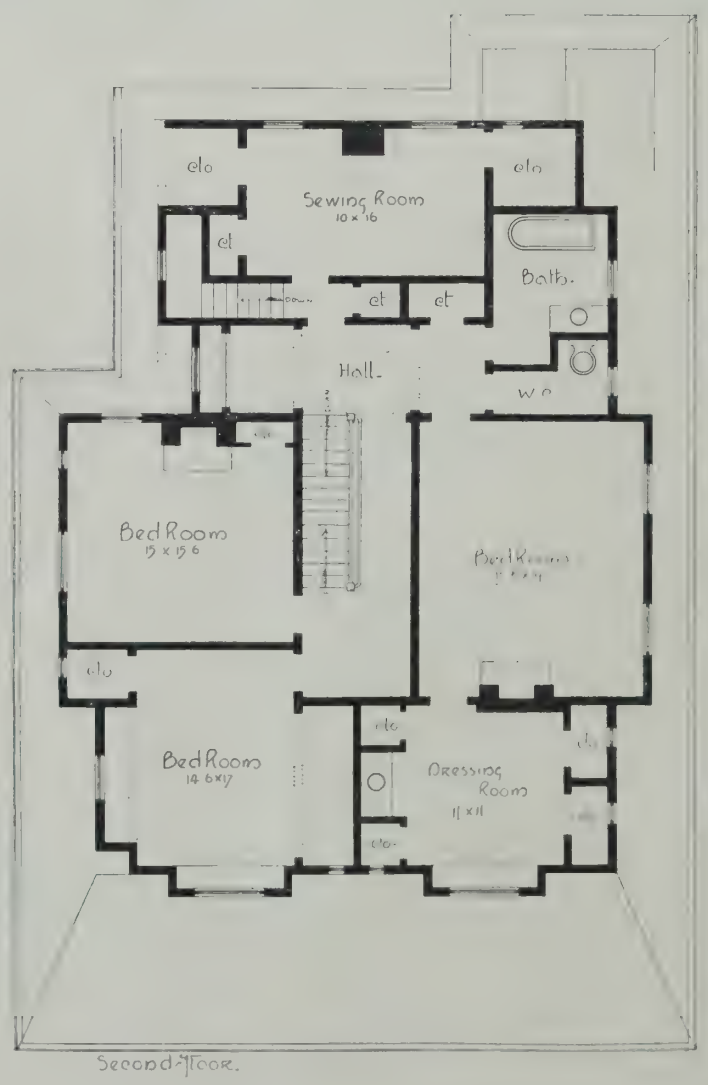


Second Floor.

A RESIDENCE AT NEW HAVEN, CONN.—See page 3.

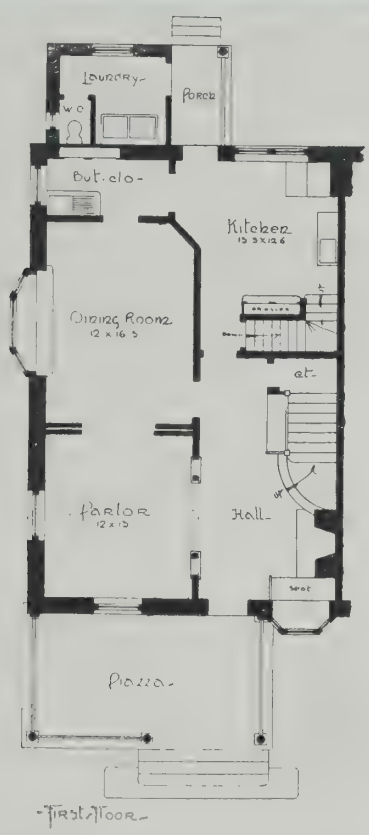
MR. R. CLIPSTON STURGIS, ARCHITECT.





A MODERN RESIDENCE AT BENSONHURST, LONG ISLAND.—See page 16.

MR. JOHN J. PETTIT, ARCHITECT.

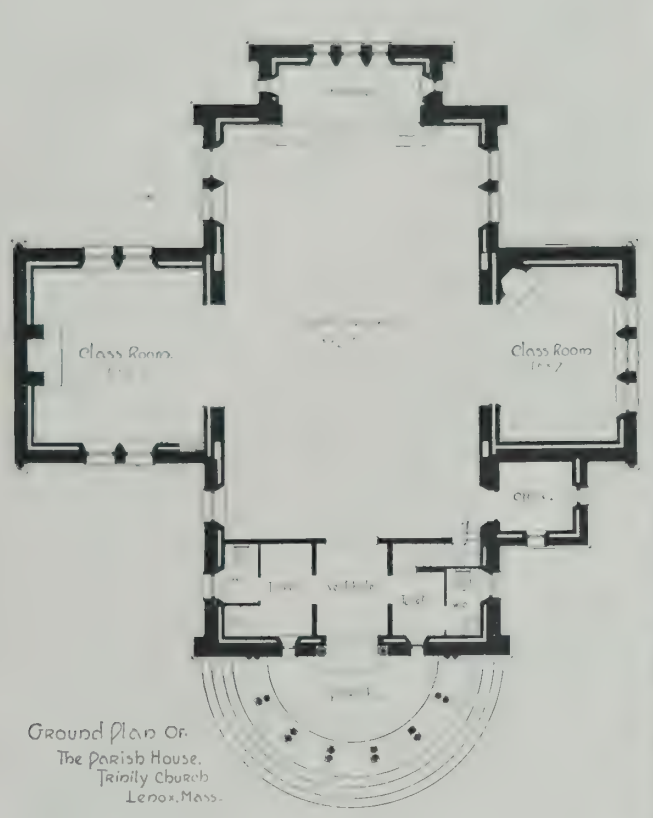


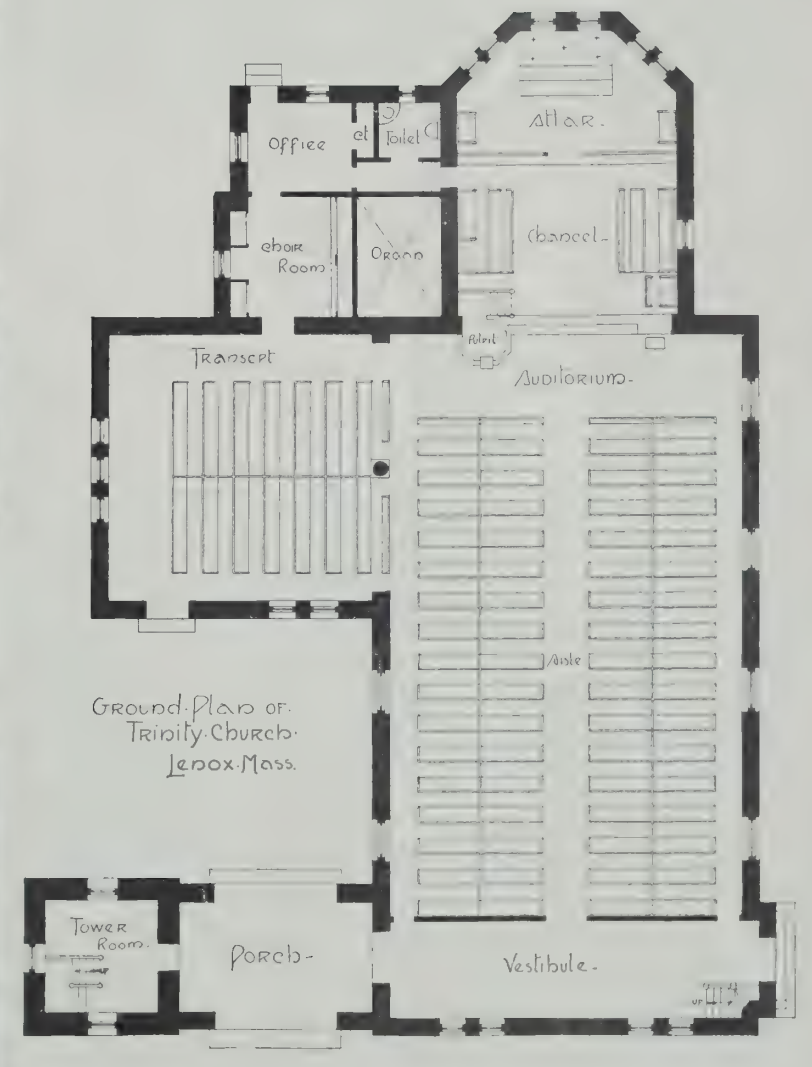
A PAIR OF HOUSES AT PELHAM, PA.—See page 16.

MESSRS. KEEN & MEAD, ARCHITECTS.

THE RECTORY OF TRINITY PARISH, LENOX, MASS.—See page 16.

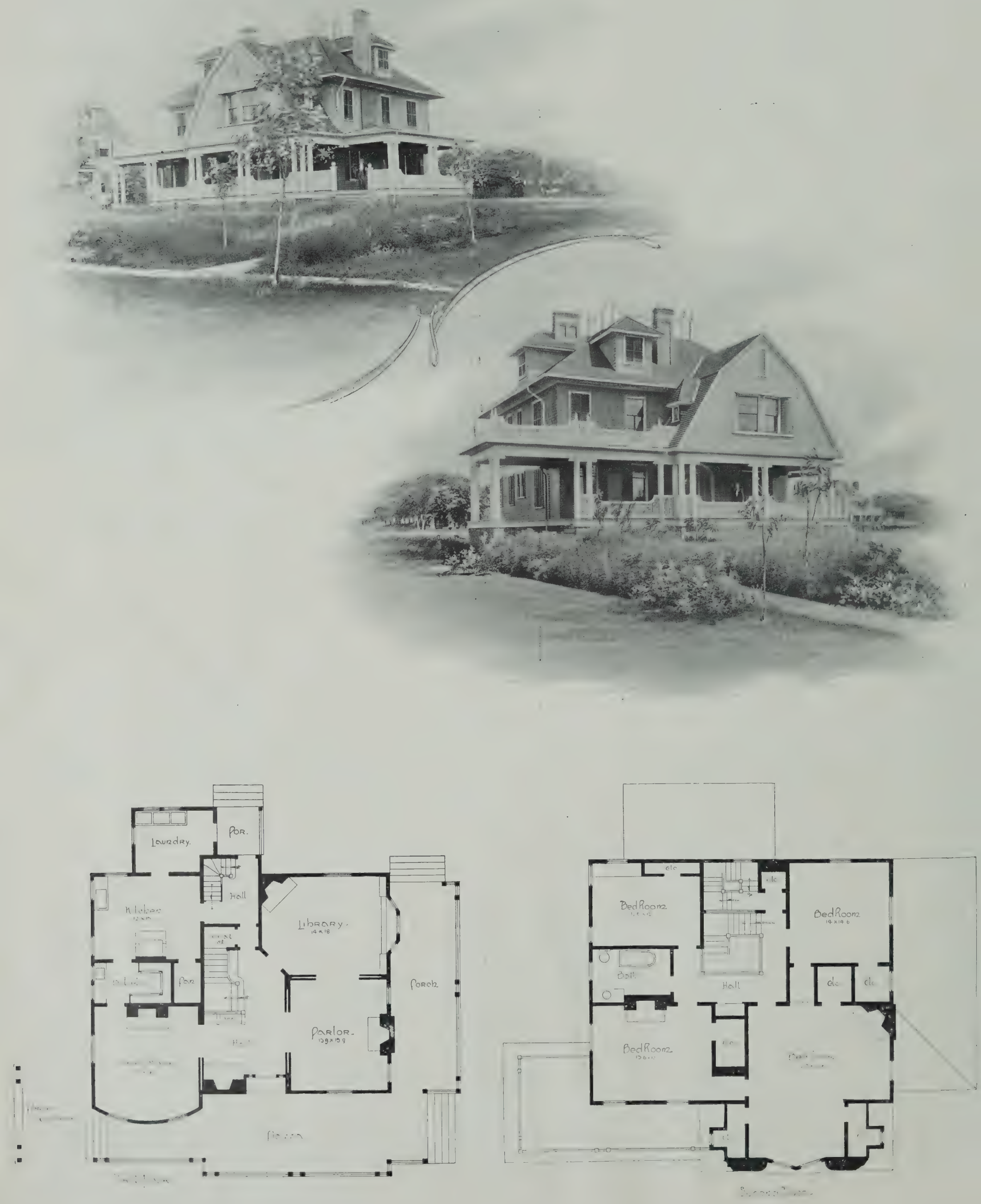
MESSRS. THOMAS ROWE AND JAMES BAKER, ARCHITECTS.





TRINITY CHURCH AND PARISH HOUSE, LENOX, MASS.—See page 16.

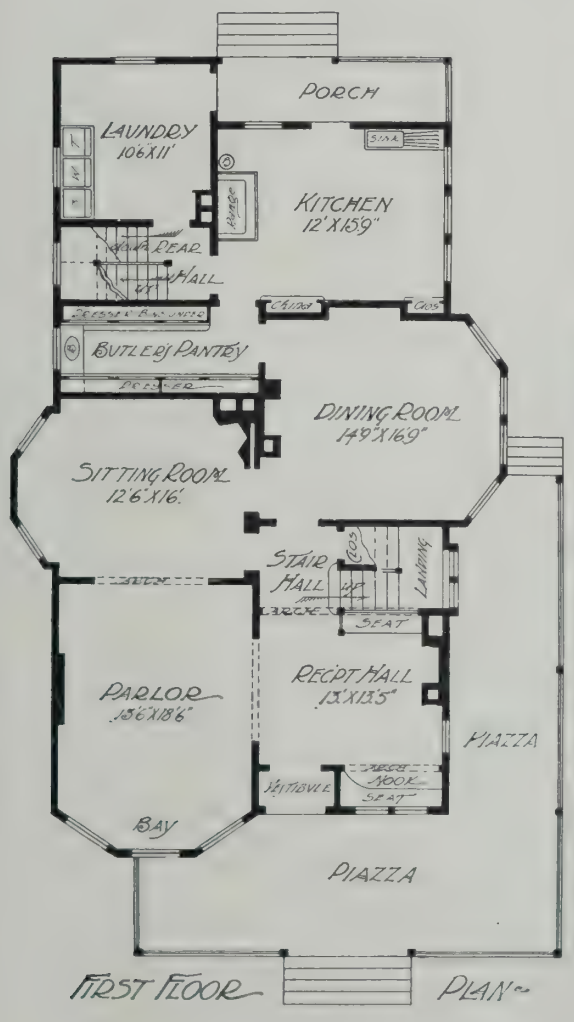
COL. R. T. AUCHMUTY, AND MESSRS. ALEXIS REED McILVAINE AND ALLEN TUCKER, ARCHITECTS.

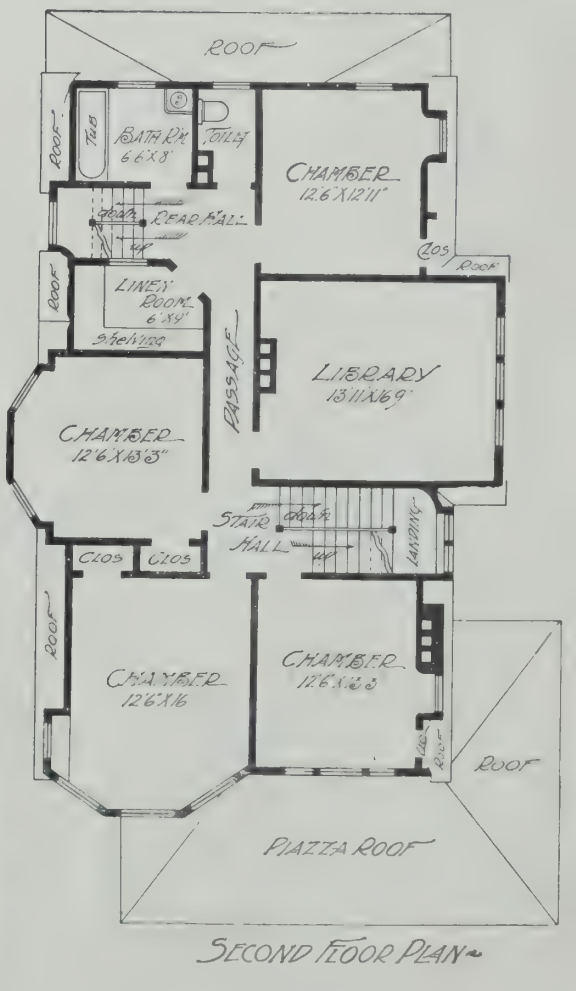


A RESIDENCE AT SOUTH ORANGE, N. J.—See page 17.

MR. RICHARD K. MOSLEY, ARCHITECT.

BOSTON PUBLIC LIBRARY





A DWELLING AT WASHINGTON, D. C.—See page 16.

MR. CHARLES BURDEN, ARCHITECT.

BOSTON PUBLIC LIBRARY

A RESIDENCE AT NEW HAVEN, CONN.

(*Continued from page 3.*)

tains bookcases built in and paneled divans at windows. The dining-room is treated in an oak green, with old-yellow walls, and it contains an open fireplace, with tiled hearth and facings, and mantel. The butler's pantry, of unusual dimensions, is fitted up with drawers, dressers, cupboards, sink, and dumb-waiter. The box-room and bedroom are fitted up complete, and both are excellent conveniences. The second floor is treated in cream white, and it contains four bedrooms, seven closets, dressing-room, and bathroom, and two servant bedrooms, with private stairway to first story and basement. The bathroom is furnished with porcelain fixtures and exposed nickelplated plumbing. The basement contains the kitchen and its apartments, laundry, furnace, and other necessary apartments. Mr. R. Clipston Sturgis, architect, 19 Exchange Place, Boston, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A PAIR OF HOUSES AT PELHAM, PA.

We present, on page 11, a pair of houses, which have been erected for Messrs. Wendell & Smith, at Pelham, Pa. The buildings are unusually attractive, and are treated in the colonial style of architecture. The underpinning and first story, up to the level of window sills, is built of red brick, laid up in red mortar; the building above this brickwork to roof is pebble-dashed. The trimmings are painted white. The roof is covered with shingles and left to weather finish. Dimensions: Front, 50 ft., including both houses; side, 38 ft., not including porches. Height of ceilings: Cellar, 7 ft.; first floor, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. Both houses being alike, we present plans and description of one house only. The interior arrangement is excellent. The hall is a very attractive apartment, with its bay window, paneled seats, and open fireplace furnished with tile facings and hearth and mantel. It also contains an ornamental staircase, with delicate turned balusters and newel. A bicycle closet is provided under stairs. The hall is separated from parlor by an archway supported upon colonial columns; this hall and parlor are treated with white enamel. The dining-room, of good dimensions, is finished in red mahogany, and it has a large flower bay window and seat. The butler's pantry and kitchen are treated in white enamel. The kitchen is wainscoted four feet in height with white enameled tiles. These apartments are furnished with all the best improved fixtures. The laundry is finished with natural pine, and is furnished with two Troy laundry tubs and servants' closet. The second floor is treated in white enamel, and it contains a sitting-room, three bedrooms, and bathroom. The sitting-room is provided with an open fireplace, trimmed with tiled hearth and facings, and mantel. The bathroom is paved and wainscoted with white tiling, and is furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor is trimmed with white pine, finished natural, and it contains two bedrooms, linen closets, and trunkroom. A cemented cellar contains furnace and other necessary rooms. We present an extra photograph of the same design, showing it constructed of rock-faced stone instead of brick. Messrs. Keen & Mead, architects, 1420 Chestnut Street, Philadelphia, Pa.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

AN OLD DWELLING IN BAMBERG, GERMANY.

If a man steps out of the walks of ordinary life and performs, or has performed for him, a task, to execute which other men have neither the ability nor the means, he is either honored as a genius or regarded as an eccentric. By the latter title the townsmen of Bamberg designated their fellow-citizen and archivist, J. J. J. Böttinger, who lived among them during the end of the seventeenth century and the beginning of the eighteenth. And why? Chiefly because Böttinger, a *connoisseur*, and a man richly blessed with worldly goods, had had two large dwellings built for him which, in the opinion of his contemporaries, were far too large and too princely in magnificence for the uses of a private citizen. One of these houses was built by Balthasar Neumann in the light, graceful, yet stately style peculiar to all his work. The other house, which forms the subject of the accompanying illustration, is somewhat older, having been completed in 1680. The architect of this earlier structure was Johann Leonhard Dietzenhofer, one of the greatest architects of his time.

Böttinger's house shows excellently the peculiar architectural tendencies of Johann Leonhard Dietzenhofer. He has evidently studied the baroque buildings of Italy and knows how to copy them. But the slender, elegant forms of the original have sometimes been vigorously, even coarsely, remodeled. To confirm this view, one has only to glance at the window-caps of the second story.

The prominent, massive mouldings with which the building has been decorated are characteristic of Dietzenhofer as well as of Neumann. But in proportioning the various parts of his structure to make an harmonious whole Dietzenhofer was inferior to Neumann.—*Blätter für Architektur und Kunsthandwerk.* Verlag von Julius Becker, Berlin, SW.

A MODERN RESIDENCE AT BENSONHURST, LONG ISLAND.

The engravings on page 14, in this issue, illustrate a modern residence, which has been erected for Mr. Keaton, at Bensonhurst, Long Island. The design is of modern treatment, and presents many excellent features, the lines being well broken by numerous bay windows, projections, and piazza, with its roof sloping up to main roof. The underpinning is built of red brick, laid up in red mortar. The superstructure is of wood, and is covered on the exterior with sheathing, paper, and shingles, stained a deep rich red color, while the trimmings are painted cream white; blinds painted bottle green; roof shingled, and finished natural. Dimensions: Front, 40 ft. 6 in.; side, 61 ft. 6 in, not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The hall and vestibule are treated in a handsome manner, with red papered walls and white enamel woodwork; it has paneled wainscoting and ceiling beams, and also divans built in, and is lighted by a cluster of stained-glass windows. The staircase hall is separated from entrance hall by an archway, and it contains an ornamental staircase, turned out with newels, posts, and balusters, treated in white enamel, and a mahogany rail. The reception-room is treated in white enamel, with green-striped paper on walls. It contains an ornamental fireplace, with tiled hearth and facings, and mantel of special design. The living-room is trimmed with ash, and it has a paneled wainscoting, four feet in height, a beamed ceiling, bookcases built in, and an open fireplace, with tiled trimmings and mantel. The dining-room is trimmed with mahogany; it has a paneled wainscoting, 6 feet in height, and a beamed ceiling, and, also, a fireplace, trimmed with tiled hearth and facings, and a fine mantel of mahogany, handsomely designed. The butler's pantry, and kitchen and its apartments, are trimmed and wainscoted with cypress, and are furnished with all the best modern conveniences. The bicycle-room, and lavatory at side, are conveniently located, and are well fitted up. The second floor is trimmed with cypress, and it contains three bedrooms, dressing-room, large closets, bathroom, and sewing-room. The bathroom is wainscoted, and is furnished with porcelain fixtures, and exposed nickelplated plumbing. The third floor contains one guest-room, servants' quarters, and ample storage. A cemented cellar contains laundry, furnace, and other necessary apartments. Cost, $7,500, including furnace, and everything complete. Mr. John J. Pettit, architect, 186 Remsen Street, Brooklyn, New York.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

DWELLING AT WASHINGTON, D. C.

On page 15 we illustrate the residence of Greenville Lewis, Esq., at Elkington, a suburb of Washington, D. C. The design is quite original and artistic in treatment, and has been constructed in first-class manner, of best materials; the great expanse of gambrel roof is well broken by numerous bays, dormers, etc.; detail in the colonial style; a well-shaded piazza, with hipped roof above, supported by square columns, runs to front and side bays; however, still permitting an abundance of direct light and sunshine to enter the principal rooms. Foundation of brick, exterior framework above sheathed, papered, clapboarded, and painted light yellow at first story, all above being shingled and stained dark brown; roof also shingled and left to weather; trimming color, light blue; sash, yellow; chimneys, red brick. Dimensions: Front, 28 ft.; side, 53 ft., exclusive of bay or piazza projections. Heights: Cellar, 8 ft.; first floor, 11 ft.; second, 10 ft.; attic, 8 ft. A wide entrance door leads through vestibule to reception hall, having an open fireplace in decorated tiles, mantel being of oak, with shelf above and beveled mirror at back; seat in nook at front mullioned window, also at stairs, here having a paneled back, which also forms cheek for stairs and base, for square decorated column, running up to flat arch above, with spindles forming screen; similar treatment of opening to parlor, having fireplace faced with decorated tiles, and ornate mantel above, with beveled mirror back. Sitting-room has angle fireplace, and connects with dining-room through sliding door; in this room fireplace is centred and tiled in brown decorated tiles, the mantel above being in same wood as in sitting-room (oak) and mirror backed; recess allowed for buffet, butler's pantry is generously provided with dressers and bins, with a sink at the window. The kitchen is supplied with usual fixtures, and the rear hall, with back stairs, forms a passage to laundry, which has three tubs and a separate door to the rear porch. The second floor plan shows four chambers of good size, all with closets, the library is located where quiet is assured, the large linen room is supplied with shelving, etc., and the bathroom with fixtures of best make, the toilet being separated and all the plumbing being exposed. The attic has four large rooms, finished off, and ample storage space. The cellar, cemented and plastered, contains servants' toilet, fuel, storage, and furnace room, steam heat being used, indirect on first floor and direct above; the house is lighted by gas and electricity; yellow pine, natural, is the trim throughout. Chas. Burden, Esq., architect, Washington, D. C.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A COLONIAL RESIDENCE AT BENSONHURST, L. I.

The engravings shown on page 7 illustrate a residence which has been erected recently for Dr. P. A. E. Boetzkes, at Bensonhurst, L. I. The building is treated in the colonial style and colors, and it has some excellent features, including swell bay windows, spacious piazza, and a gable roof well broken by ornamental dormer windows. The underpinning is built of red brick laid up in red mortar. The superstructure is built of wood, with the exterior framework covered with sheathing, paper, and clapboards, and then painted a light yellow, with white trimmings. The roof is shingled and stained a dull green color. Dimensions: Front, 48 ft.; side, 40 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The house is trimmed throughout with whitewood. The hall is a large apartment, open, and is finished off natural. It contains an ornamental staircase, with newels, posts, and balusters, and a broad landing with cluster windows. The fireplace is built of brick and furnished with tiled hearth and facings and mantel of oak with columns. The parlor is treated in china white, and it has an open fireplace, with white enamel tiled facings and hearth, and mantel with columns. The library is finished natural, and it has facings of Delft tile and mantel of oak. The dining-room is finished in cherry, and it contains a china closet and buffet built in, with leaded glass doors. The kitchen and pantry are fitted up with the best modern fixtures. The rear hall is a convenience, and it has a stationary bowl built in. The second floor contains an open hall, one large bedroom, with fireplace and seat, which is used as a sitting-room, and three bedrooms and bath; the latter is wainscoted and furnished with porcelain fixtures and exposed plumbing. The third floor contains three bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

TRINITY PARISH, LENOX, MASS.

We present, on pages 12 and 13, illustrations of the Trinity Parish buildings at Lenox, Mass. The buildings illustrated are the church, parish house, and rectory. The buildings are located in the centre of the village of Lenox, and are most beautifully situated on a triangular tract of land, forming entrances on two avenues. Trinity parish was founded in 1763, and, after a long struggle, was very gracefully overtaken with prosperity, and in 1888 found its full expression in the erection of the new church, which we illustrate, through the untiring efforts of its rector, the Rev. Justin Field, and through the generosity of its warden, Col. R. T. Auchmuty, who is also designer of the building. The cornerstone of the church was laid on September 8, 1885, by Mr. Field, assisted by ex-President Arthur, and was consecrated on June 19, 1888, by Bishop Paddock, the sermon being preached by Bishop Potter, of New York. The building is constructed of granite of a soft bluish-gray color, with its faces left rough as they come from the quarry. The roof is covered with red tile. The entrance porch is paved with tiles, while the vestibule has a floor laid with mosaic tile. The interior is trimmed with oak throughout. The pews and furniture are of oak. It has a paneled wainscoting of oak, and a ceiling which is heavily beamed and trussed, of ornamental metal. The auditorium, 40 x 66 feet, has a seating capacity of 350, with an addition of 100 in transept, which is 30 x 30 feet in dimensions. The chancel is very handsomely finished off with mosaic tiled floor, oak furniture, wainscoting, a beamed and paneled ceiling, and altar carved and trimmed with ornaments. The windows, as well as those in auditorium, are of a memorial character, and are rich in design and color. The floor in aisles is laid with mosaic tile. The choir-room, office and its apartments are conveniently located, and are fitted up with all the conveniences. A cellar under building contains the furnace and storage apartments.

The parish house, which we illustrate on page 13, was built by John E. Parsons, Esq., as a memorial to the late Mrs. Mary Dumesnil Parsons. It was dedicated on June 7, 1898, by Bishop William Laurence, of Boston. The building is treated in the Romanesque style of architecture, with a French feeling. The most striking feature is the circular porch at front, with its sweeping steps, from which rise numerous clusters of columns of polished pink granite, mottled in effect. These columns rise up and support arches and roof. The floor of this porch is laid with mosaic tile. The building is constructed of local quarry-faced granite of a soft grayish

color, while the trimmings are dressed. The roof is covered with red tile slate, with harmonious effect. The building is cruciform in design, and is 60 feet long from entrance to chancel and 60 feet wide from transept to transept. The entrance doors are of massive design, with heavy hinges. The interior is very beautiful. The ceiling is heavily trussed and beamed, and the walls are interlined with buff brick. A feature of this wall, worthy of mention, is the air space between the outside stone wall and the interior brick wall, with ventilators carried up to roof plate. The woodwork throughout is of old English oak. The vestibule has a mosaic tiled floor and oak trimmings. On either side of vestibule are toilet-rooms, conveniently located, and furnished with porcelain fixtures and exposed nickelplated plumbing of the best approved kind. The auditorium and classrooms have a paneled wainscoting 4 feet 6 inches in height. The chancel is reached by marble steps to platform, which is laid in mosaic. The chancel has a marble wainscoting, and it has also furniture of oak and a carved lectern designed and made by Tiffany. The classrooms have open fireplaces, furnished with tiled hearths and facings, and oak mantels. The auditorium can be used for Sunday-school, mission work, lectures, and entertainments, while the classrooms can be well utilized as parlors for social affairs. The cellar contains furnace and storage, and the building is lighted by electricity. Messrs. Alexis Reed McIlvaine and Allen Tucker, architects, 48 Exchange Place, New York city, N. Y.

The Rectory of Trinity parish, which we illustrate on page 12, is built in a most artistic manner, and in keeping with the church and its surroundings. The design presented by the engravings shows a rectory treated in a most excellent manner. The underpinning and the main part of first story is built of granite of a bluish-gray color, with the faces left rough as they come from the quarry. Polished columns of similar stone are placed between the double windows. The entrance-way has dressed stone steps, and a terrace with stone balustrade and tiled floor. The remainder of the building is constructed of wood, and the exterior is covered with sheathing-paper, and then covered with cedar shingles and left to weather finish a natural silvery gray color. The roofs are also shingled. Dimensions: Front, 41 ft.; side, 75 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior is trimmed and finished in a very handsome manner. The main hall is trimmed with oak. It has a paneled wainscoting 4 feet 6 inches in height and a beamed ceiling. It contains a vestibule, a pleasant nook with seats, and spindle transoms, and an ornamental staircase turned out of oak, with coat closet beneath same. The parlor is trimmed with whitewood, and treated with four coats of white enamel paint. It has a beamed arch over the octagonal projection, and it contains an open fireplace with white-glazed tiled facings and hearth, and mantel to correspond with trim. The library, or study, is trimmed with butternut, and it has bookcases built in all around the room, with window seats at the windows, and it contains a fireplace with tiled facings and hearth, and a mantel of excellent design. The dining-room is trimmed with oak, and it has a paneled wainscoting six feet high and a boxed beamed ceiling. It has also an open fireplace, with tiled trimmings and mantel. The butler's pantry, kitchen, and laundry, and also store closet, are trimmed and wainscoted with ash, and are fitted up with the best modern conveniences. The rear hall is conveniently located, and the toilet is wainscoted with cherry and is well fitted up. The second floor contains five bedrooms, two servants' bedrooms, with maid's closet isolated from main part of second floor, linen closet, large closets, and two bathrooms, the latter wainscoted and trimmed with cherry, and furnished with porcelain fixtures and exposed nickelplated plumbing. The floors in both stories are of North Carolina pine, laid in narrow widths. The third floor contains two bedrooms and ample storage room. A cemented cellar contains furnace and coal cellars. Messrs. Thomas Rowe and James Baker, architects, New York, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT SOUTH ORANGE, NEW JERSEY.

The engravings on page 14 illustrate the residence of S. B. Hanna, Esq., at South Orange, New Jersey. The design is admirable, and presents many excellent features, together with a well-arranged plan. The underpinning is built of brick, laid up in red mortar. The superstructure above, of wood, is covered on the exterior with sheathing and paper. The first story is clapboarded, and painted bottle green, with cream white trimmings. The second and third stories are covered with shingles, and finished natural. The roof is shingled, and stained a dark green. Dimensions: Front, 44 ft.; side, 46 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The main hall is a very attractive room, with an arched vestibule entrance, with door and side lights. It is trimmed with oak, and has a paneled wainscoting, ceiling beams, an open fireplace, furnished with tiled hearth and facings, and mantel, divan, and an ornamental staircase, with carved newel posts, balusters, and rail. The parlor and library are trimmed with oak, and they have open fireplaces, trimmed with tiled facings and hearth, and mantels, while the latter has bookcases and window seat built in. The dining-room is also trimmed with oak, and it has a paneled wainscoting, ceiling beams, and fireplace. The floors of these apartments are laid with hardwood. The butler's pantry and kitchen are trimmed and wainscoted with white pine, and are furnished with the best modern conveniences. The laundry is trimmed and furnished similarly. The second floor is trimmed with whitewood, and finished natural, with the exception of the large bedroom, which is treated with china white. This floor contains four bedrooms, large closets, and bathroom; the latter having a tiled wainscoting, paved floor, porcelain fixtures, and exposed plumbing. The private stairway, leading from cellar to third floor, is a convenience. There is provided on third floor three bedrooms and bathroom, besides ample storage. Cemented cellar contains furnace and other necessary apartments. Mr. Richard K. Mosley, architect, Produce Exchange Building, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A DOUBLE HOUSE FOR SMALL FAMILIES AT STONEHAM, MASS.

We present, on page 6, illustrations of a convenient double house for small families, several of which have been erected by E. R. B. Chapman, architect, Stoneham, Mass. The elevations, which are shown in the engravings, are very simple, the entire effect being obtained by the contour of the mass. The underpinning and wall is built of seam-face local stone, selected colors, pointed in black mortar, with a V-joint painted white. The exterior of the building is shingled throughout, and stained a dark green. All trimmings and sash are of a colonial cream. The interior is made as cozy as possible, one living-room being treated in white, with dark green paper, ceiling to match, and 2 feet 6 inches border of hardwood at floor. The hall is natural, with a light terra-cotta paper. The other side has the colors reversed, the living-room being red and the hall green. The kitchens are sheathed in North Carolina pine, with rift floors and painted walls. The second story is finished with cypress and North Carolina pine floors, there being no soft-wood floors in the house. In the attic there is one chamber, and in one or two instances a bathroom. The cellar contains a laundry, coal bins, toilet accommodations, and vegetable cellar for each side. The entire house is built for economy in housekeeping, and is so arranged that an entire side can be heated from the kitchen range by using a Nemo heater, taking not over three tons of coal per year. The exterior dimensions are 24 x 30 feet. Cost, including wall, $2,890. Mr. E. R. B. Chapman, of Rand & Chapman, No. 6 Beacon Street, Boston, is the architect.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

Influence of Sea Water on Mortars.

M. E. Caudlot, in a recent paper, describes the action of sea water on mortars, and his investigations in the harbor of La Rochelle since 1856 are of much value, as they extend over a period of forty years. Blocks of sixty centimetres in length were exposed to the open sea from 1856 to 1875, and were above the water surface at low tide. The mortars were of hydraulic limes of different origin, of natural cements from Pouilly, Vassy, etc.; of artificial pozzuolanas mixed with lime and sand; of trass from Andernach, etc. Nearly all blocks had completely lost their cohesion after different periods. The few blocks of Portland cement experimented upon were in good condition; but blocks of neat cement (English and French) were decomposed. From these tests Viennot draws the following conclusions: (1) Neat cements are destroyed more rapidly than mortars of a certain composition. (2) Mortars made of one volume of cement to one of sand, and, again, of one volume of cement to two of sand, are those which offer the greatest resistance to sea water. They will last for twenty, thirty-six, and thirty-eight years. Thurninger commenced new tests with blocks of masonry, and concrete made of lime and Speil mortar, with a length of edge of forty centimetres. In 1895 the masonry blocks disappeared, their destruction having commenced four years after their exposure, and out of thirty-two concrete blocks only twenty-six remained, but they were in advancing decomposition. In 1880 other tests were commenced on block submerged, of various limes. Many of these have perished. "Out of thirty-one masonry blocks laid in Portland cement mortar, and submerged between 1881 and 1892, twenty-three are still intact, while some have commenced to disintegrate." Viennot points to the following conclusions: (1) Mortars of hydraulic lime, mixed in any proportion, in most cases commence to disintegrate after one or two years' immersion in sea water; they crumble into pulp after periods varying in length, but apparently not exceeding fifteen years. (2) Concrete resists better than masonry, owing to the greater density imparted to it by ramming. (3) Rapid-setting cements may commence to disintegrate after six or eight years, but may last longer than thirty-eight years without crumbling. (4) The mortars offering the greatest resistance are those consisting of one part cement to one or two parts of sand. This mixture corresponds to the weight of cement required to fill the spaces between the grains of sand. These, therefore, are the least porous mortars.—*Building News.*

Quicksand.

Very little is known by the general public about quicksand, and that little is usually obtained from novels. Such information is usually wrong, being composed of a pinch of truth and a handful of fiction. The sensational novel goes even so far as to give to quicksand some attributes that belong only to living creatures. No ordinary observer could distinguish quicksand from any other if it were dried; and if he wished to restore its fatal property artificially, he would in all probability, fail. Suppose he fills a bucket with it in the dry state, and soaks it with water; it does not in consequence become mobile. If he drains the water off from the bottom, the sand will be found wedged firmly in place, and if the water be measured it will be found to equal 30 per cent. of the bulk of the sand, or about 20 per cent. of its weight. From this we may infer that a cubic foot of dry sand weighs nearly 94 pounds. This, for sand, is a very light weight, for there are other qualities of sand which weigh as much as 171 pounds. Quicksand, when examined under the microscope, will be seen to have rounded corners, like river sand, as distinguished from angular or "sharp" sand, which will pack more solidly than the other. It is quicksand that is used in the hour glass and in the smaller egg boiler, partly because of its fineness and partly because it does not obscure the inner surface of the glass by scratching. The lightness of quicksand is the quality which will lead us most surely to the cause of its reputation, and to illustrate this the bucketful of sand must be loaded with water from below, and made to overflow very slowly. The upward current will be found to loosen the sand and to raise the surface very slightly, separating and lubricating the particles so that they are easily displaced. The bucket now contains quicksand, and this sand, from the support it receives from the water, has its weight or supporting power reduced. In the dry state it weighed nearly 94 pounds, but if weighed in the water it is reduced to 32½ pounds, and its mobility prevents any animal from walking on it. The mixture of sand and water weighs quite 112 pounds per cubic foot, or nearly twice the weight of water, and bulk for bulk nearly twice the weight of a man, but it is too thick to swim in, and the person ingulfed would soon be too exhausted to escape. He would probably die of suffocation, if not drowned by an advancing tide, for quicksands are found mostly within the influence of tides. He would not be swallowed by the quicksand, because it is so much heavier than his body, Quicksands require in all cases an upward current which is not quick enough to form what is called a spring or fountain. It may be formed in two ways: In tidal rivers and on the shores of tidal seas the rising tide may saturate a porous stratum of ground below high water mark, and when the tide falls a return current is established through the same porous (sandy) ground, with a sufficient velocity to loosen the sand as above described. This sand, as soon as the rising tide reverses the current, ceases to be "quick." The other case is that when a slow current of fresh water finds an exit through a surface of sand above or below water. This is a permanent quicksand. Any sand, and almost any material, might have the quality of quicksand imparted to it by means of a suitable current. Coal is separated from shale in an upward current of water, so regulated that the coal is made to float while the shale falls to the bottom, and heavy iron tools have been carried to the surface by the sudden discharge of artesian wells. Quicksands that are encountered during the sinking of wells and foundations are all due to the influx of water when the work gets below "spring level," or the level of water in the ground. The sand, being deprived of the support of the excavated part, is pushed from behind by the water current flowing in from all sides.—*Invention.*

Wisconsin's Big Stone Cut Up.

The famous brownstone monolith at Washburn, Wis., is no more. It was quarried by Frederick E. Prentice in 1892 for the Wisconsin exhibit at the World's Fair. The labor alone cost over $5,000, but the money to transport it to Chicago was never raised. The monolith when completed measured 115 feet in length and nine feet at the base, being the largest block of stone ever quarried. It has lain in its bed of sand and water for six years, and as there seemed to be no probability of its being made use of in its original form it was sawed into blocks, and is being shipped to Menasha, where it will be used in the construction of a residence and a barn.—*Chicago Inter-Ocean.*

A NEW UNIVERSAL WOODWORKER.

A patented universal woodworker, built and designed by the Egan Company, Nos. 209 to 229 West Front Street, Cincinnati, Ohio, has advantages and conveniences possessed by few other woodworkers. The immense variety of work performed by this machine, and the different ways in which it can be adapted to various kinds of work, has earned for it the title of "Universal," or "Variety Woodworker." This woodworker will make glue-joints; plane "out of wind"; chamfer; cross-grain; groove; cut straight; circular or elliptical moldings; tongue and groove; corner; plane taper; raise panels; miter; rabbet. The machine will rabbet and joint window-blinds at one operation; make serpentine and wave molding; table joints; will flute and bead on the corners or the face of balusters; will plow, rip and cross-cut, bore and rout.

The column is cored out, is cast in one piece, and is very heavily braced, widening very much at the base, and making a very solid support for the machine. One particular point in which this machine excels all others lies in the patent-connected, movable bearings, which are adjustable laterally across the machine in square gibbed slides, by the small hand-wheel in front. When the operator has his fence set for doing work, he can adjust the head with the greatest rapidity to the exact line wanted.

The spindle has an outside bearing which can be instantly removed by loosening one hand-bolt, thus giving free access to the head. The spindle is of the best steel, runs in self-oiling bearings, lined with the best material, with the driving pulley between the bearings. All cutter-heads used are made of the very best material, and adapted to the highest speed.

Both tables may be adjusted vertically, horizontally, and independently to the circle of the head. They may be drawn clear back from the cutter-head, thus giving free access to the mandrel and enabling any cutters, heads, or saws to be used. They may be moved back again without disarranging the tables. Both tables may be raised or lowered together, following the circle of the head, by the hand-wheel at the working end of the machine; or both tables may be raised and lowered together vertically by the large hand-wheel at the front. These adjustments will be found very convenient, as the relative positions of the tables are not changed, and the adjustment is accomplished in either instance by means of a single hand-wheel. There are four inclines to each table, one at each corner, arranged so that all wear may be taken up and the tables always kept in perfect alinement, notwithstanding any wear that may take place.

The gaining-frame is of excellent construction. The paneling frame, saw-boards, throat-irons for tenoning, etc., or cutter-heads complete for different kinds of work, can all be furnished with the machine when required.

For panel-raising, the machine is furnished with two panel-heads, with a special fence. Both sides of any door-panel, of any shape, can be raised at same time.

The patent adjustable bevel-fence can be set to any angle desired by loosening one clamp-bolt, and has free movement across the table for the different kinds of work to be done.

The boring side can be used for all kinds of boring or routing. The table is raised and lowered independently by the cranks shown in the cut. A fence for angle boring is fitted on the table, with stops for spacing the holes and routing.

This woodworker was awarded a medal at the Cincinnati Industrial Exposition; at the Cincinnati Centennial Exposition, 1888; World's Fair, Chicago, 1893; Antwerp, Belgium, 1893, and Santiago, Chile, 1894, for convenience of adjustment and originality of construction, and the trustworthy and thorough workmanship displayed throughout.

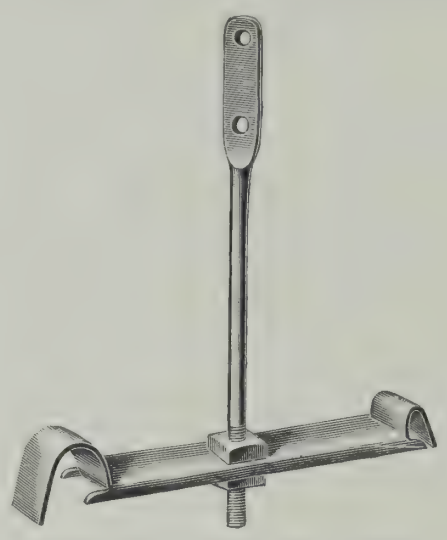
The Egan Company have had a special corps of expert mechanics and draughtsmen at work for the past year, designing and perfecting new and improved woodworking machines. The present machine is one which they have just brought out.

The company make high-grade machines for manufacturing wooden articles. They can furnish single machines or complete outfits for any kind of plant with their make of machinery, and they will be pleased to enter into correspondence with wood workers.

During the violent storm which raged in Connecticut, toward the latter part of November, the roof of Randolph & Clowes' brass and copper rolling mill, in Waterbury, fell in, by reason of which accident the mills were temporarily compelled to postpone the filling of orders. The mills have, however, been completely repaired, and the firm of Randolph & Clowes are again able to continue their business.

AN IMPROVED TROUGH-HANGER.

In the annexed illustration we present an ingenious eaves-trough hanger, made by Proudman Brothers, of Meriden, Conn. The hanger has merits which are not possessed by any other similar device. Among its most prominent features may be mentioned, the points which penetrate the trough below the bead, making the attachment at that side of the trough just as strong as at the opposite one. The points on both ends of the hanger penetrate the trough from the inside. Hence the weight of the gutter has a tendency to force the trough further on the points.



PROUDMAN'S EAVES-TROUGH HANGER.

The hanger is throughout made of tough, wrought metal, and is provided with straps of any desired length.

Keene's Cement.

Within the past few years there has developed in this country an industry, the products of which are invaluable to architects, to their clients, and to all those interested in building. The material in question, Keene's Cement, has been used principally for ornamental purposes in connection with the plastering of the better class of buildings, and has been manufactured heretofore in England, and imported to the United States, thus entailing great expense and restricting its use exclusively to the very wealthy.

Keene's Cement is manufactured by Best Bros. & Co., Ltd., of England and Medicine Lodge, Kansas, the latter being a branch of the English factory. The material is called Best's Keene's Cement.

It is a fact well known to all architects and contractors that the plastering of walls has been one of the most perplexing problems of their business, lime and sand mortar being but a poor makeshift at the best. Before they can be frescoed, walls must be covered with canvas, at great expense, so as to give the plastering sufficient strength to adhere to the walls. Thousands of dollars have been lost and artists and owners made sick at heart by seeing their beautiful work ruined in a short time after completion, on account of the cracking and falling off of the plaster. Many inventors have sought to improve and harden lime mortar, various patent mixtures have been put on the market, and architects have met with many disappointments in their efforts to procure something that would be an improvement over common lime and sand. Now that Keene's is being made in this country, it is needless to say that its introduction has been hailed with great satisfaction. When it is known that its cost is but little in excess of common lime mortar, it is evident that it can be used in all classes of buildings, from the laborer's cottage to the millionaire's mansion.

In the following paragraph we give a few extracts from the manufacturers' pamphlet:

The cement is used in conjunction with lime and sand, and acts as an agent for binding and hardening the mortar. It may be retempered as often as necessary during application, thus obviating all danger of its being killed in mixing and applying. It is unequaled as a hard finish. It has great strength and hardness, and will not turn chalky, disintegrate, or fall off. It can be troweled to a surface like marble, and is therefore invaluable for hospitals, asylums, and hotels. It forms a perfect base for frescoing.

For further particulars our readers should address the Thorn & Hunkins' Lime and Cement Co., St. Louis, Mo., whose card appears on another page.

The makers of Bommer steel hinges, Bommer Brothers, of 351-353 Jay street, Brooklyn, N. Y., have been awarded a gold medal by the judges of the Trans-Mississippi Exposition, for the structural excellence of the hinges.

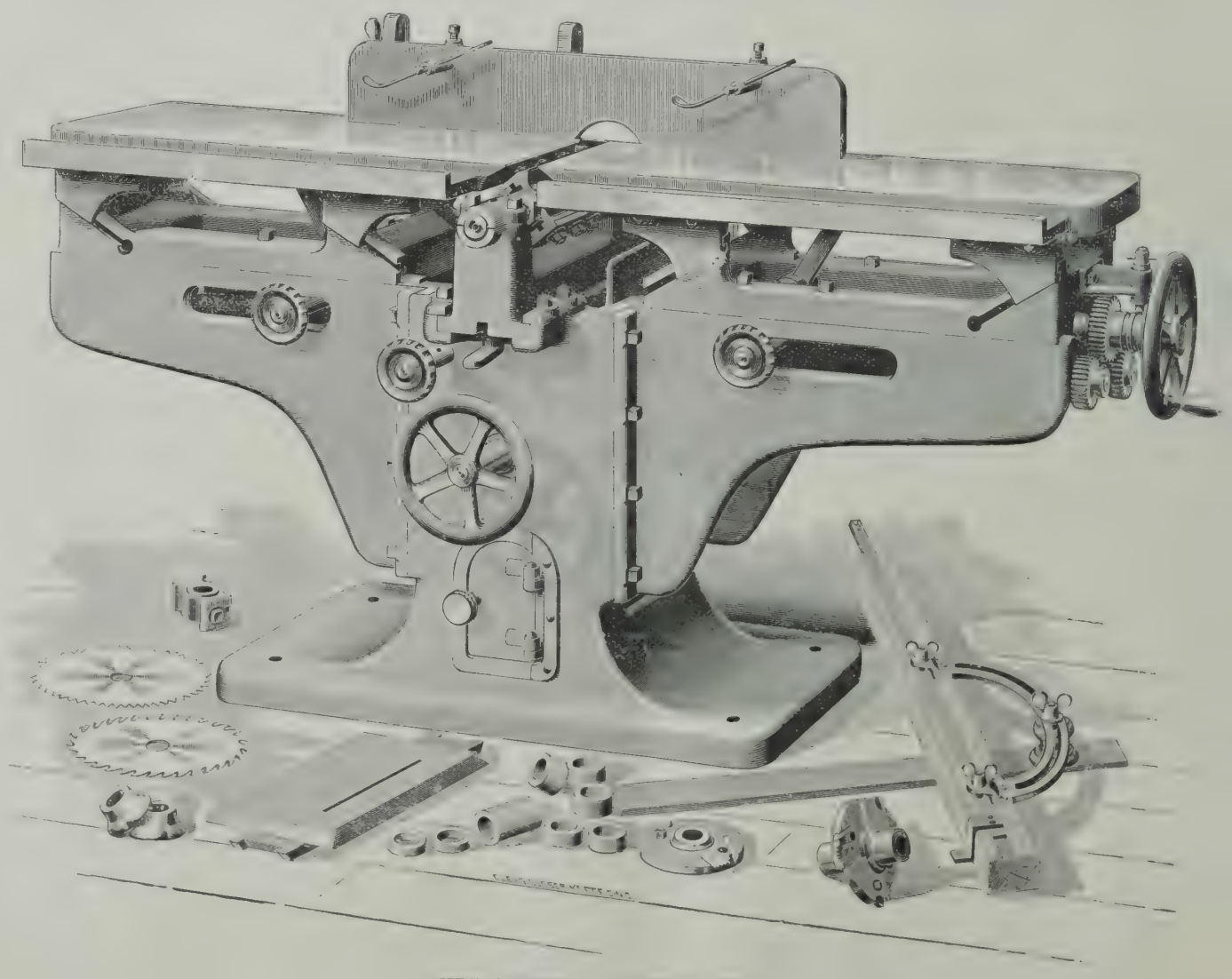
"Aquarine" Paints.

"Aquarine" is a waterproof, fireproof, disinfecting paint which is destined to supplant oil paint for many uses.

The paint is sold as a powder in all colors. It contains no glue and is fireproof. It will not mold, nor will it turn yellow or peel away. "Aquarine" paints are composed of asbestos and dolomite. Five pounds of the material, mixed with one gallon of water, will produce a paint, the cost of which is but one-third of that of oil paint. A most remarkable characteristic of "Aquarine" is the small quantity which is necessary to cover a given surface. One coat is all that is necessary; two coats are rather a detriment than a benefit. The paint can be applied either to smooth or rough surfaces, with any kind of a brush.

Samples of "Aquarine" may be obtained by applying to Muzzy Brothers, Paterson, N. J.

A well-printed and illustrated catalogue has been sent to us by the Grand Rapids Carved Moulding Co., of Grand Rapids, Mich., in which will be found many excellent half-tone engravings of new designs in mouldings. The catalogue will be sent to any address on application.



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MERCHANT'S Metal "Spanish" Tiles AND "Gothic" Shingles.

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THE STAR VENTILATOR, *Galvanized Iron, Copper, Brass.*

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The principles of hygiene demand light as well as ventilation. The Combination Skylight Star Ventilator combines both these principles.

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SAMPLES AND FULL INFORMATION GIVEN TO THOSE INTENDING BUILDING.

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VARIOUS DEVICES

are made for repairing rust holes in galvanized iron range boilers. There are never any rust holes to repair in a

BROWN BROTHERS'

SEAMLESS COPPER HOUSE-RANGE

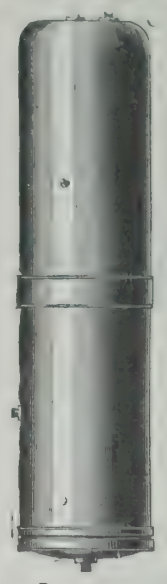
BOILER.

The smooth lining of heavy tin affords no resting-place for sediment, and insures

CLEAN HOT WATER.

NO SEAMS; NO RIVETS; NO LEAKS.

Boiler booklet, with full particulars, sent on request.



RANDOLPH & CLOWES, Box 9, Waterbury, Conn.

The Jackson Ventilating Grate

is a furnace in the fire place. It is an open grate with heat-saving chambers, increasing the usual heating power fourfold. Rooms on one or different floors are thoroughly heated and ventilated in coldest weather. Send for Catalogue F (showing construction), also for reports from your own neighborhood.

Catalogues of Mantels, Tiles, Andirons, Screens, Franklins, etc., will also be forwarded if desired.

EDWIN A. JACKSON & BRO., 50 BEEKMAN STREET, NEW YORK.

BEST'S KEENE'S CEMENT.

Guaranteed equal to the celebrated English Keene's Cement.

It is a perfect plastering material, possessing every desirable quality, viz.: strength, hardness, comparative cheapness, non-sound-conducting, fireproof, imperviousness, perfect base for frescoing, works easily under the trowel, and does not require skilled labor.

It is used as a gauging in lime mortar

thus producing a combined mortar that has to an extreme degree all the qualities above enumerated. Can be retempered or remixed innumerable times without affecting its set or strength, thus obviating danger of applying dead material, which so ***frequently*** occurs in using any other hard plastering material. For samples, pamphlets, prices, and further information, address

THORN & HUNKINS LIME AND CEMENT COMPANY,
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Sole Agent for United States and Canada.

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Something New!

Artistic and beautiful. Perfect solid color and velvet finish. Not affected by weather. Harmonize with all other colors. Write for samples and prices.

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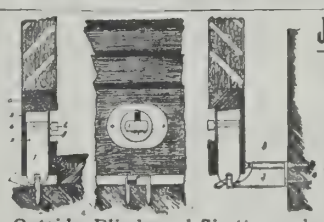


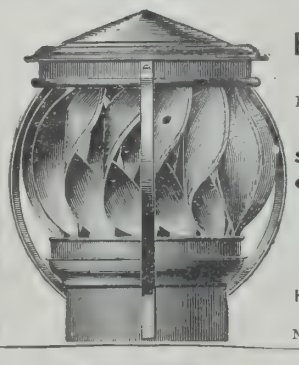
JOHNSTON'S IMPROVED AUTOMATIC BLIND CATCH.

Outside Blinds and Shutters when fitted with this attachment never fail to fasten themselves in open or closed position. Slamming impossible. Cannot break or get out of order. Price, per set, 30c.

This catch is flush with face of blind. Cannot be opened from outside. Does not interfere with fly screens.

When putting up Storm Sash and Outside Shutters use Johnston's Automatic Storm Sash Fastener, the best on the market. Each, 15c.

J. D. JOHNSTON, P. O. Box 161, Newport, R. I.



THE EMPIRE VENTILATOR.

Patented Mar. 5, 1895. Canadian Patent, June 10, 1895.

SURE CURE

For Smoky and Faulty Chimneys.

Without a rival for Sanitary purposes.

HERMANN DOERGE
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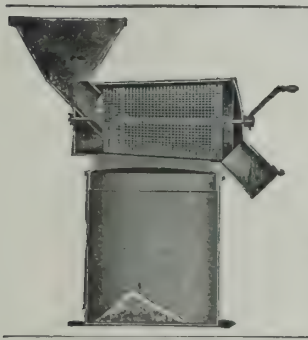

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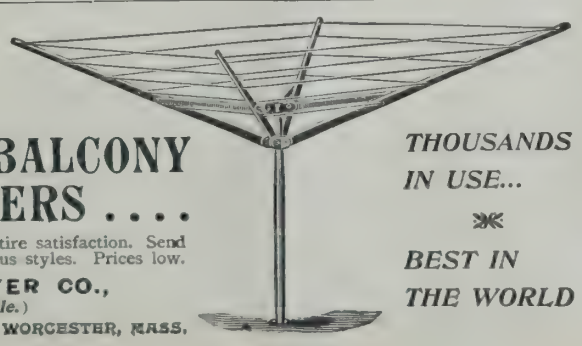

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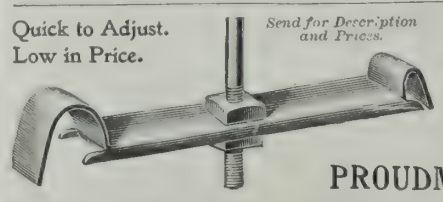

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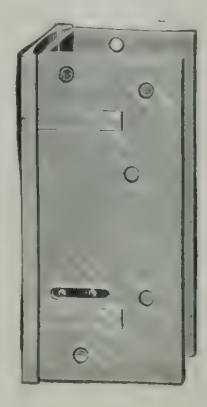

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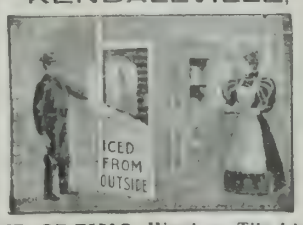

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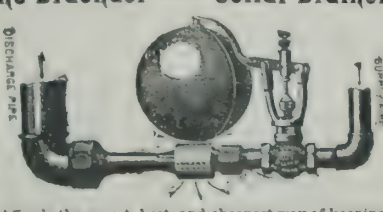

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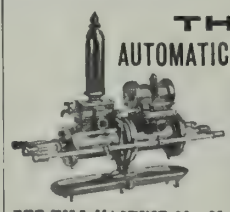

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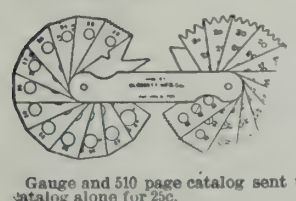

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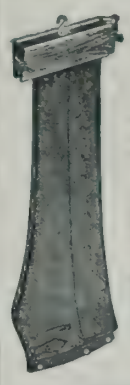

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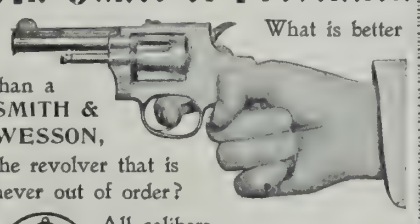

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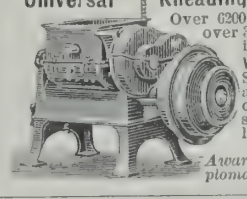

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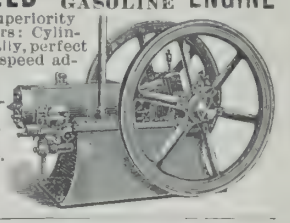

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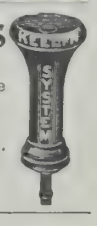

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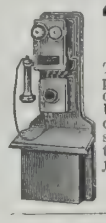

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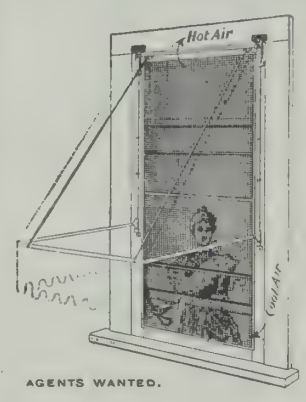

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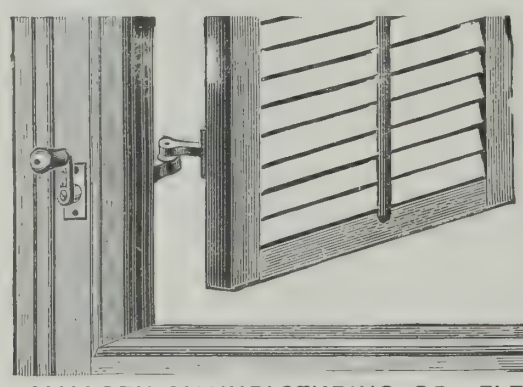

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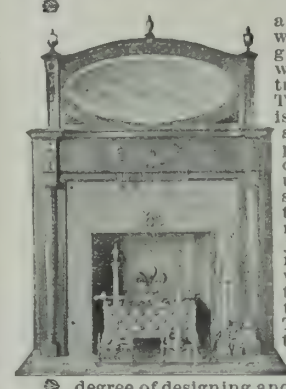

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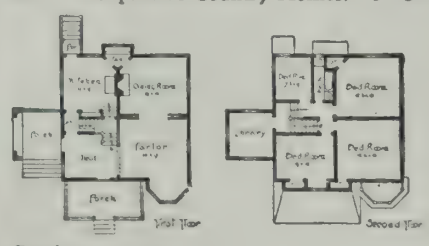

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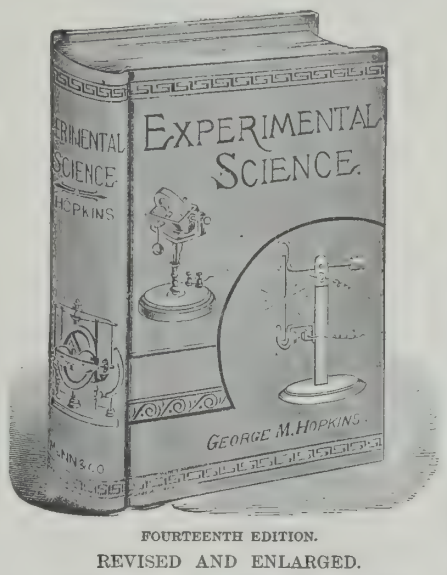

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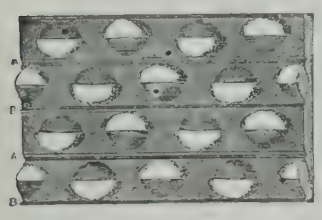

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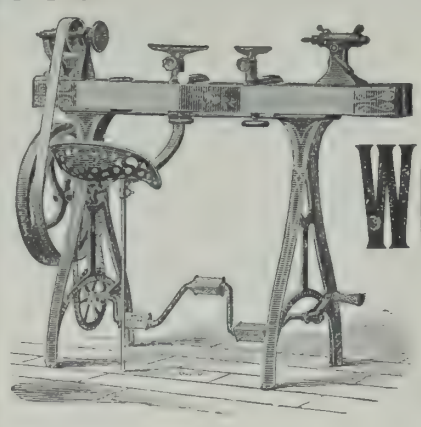

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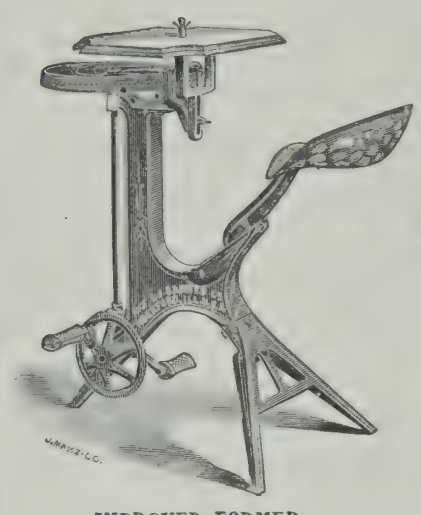

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Some real estate agents make a specialty of taking entire charge of great office buildings, and all of the help and purchasing of supplies is under their direct control. As a firm of this kind is well known, there is more chance of offices being rented by them than if the owners of the building had their own agents on the premises. Of course, an agent can purchase supplies at very advantageous rates where a number of buildings are to be supplied. These are but a few of the new problems which the new high office buildings have presented.

THE INFLUENCE OF PAVEMENTS ON PUBLIC HEALTH.

The Provincial Road Commissioner for Ontario, Can., Mr. A. W. Campbell, C.E., recently presented a paper before the Association of Medical Health Officers of Ontario on "The Influence of the Pavements on Public Health." There is so little difference between Ontario and the United States that the facts stated and the deductions he makes are equally true of our own country. He finds that even in very small villages inefficient drainages, cesspools, piggeries, slaughter houses, and impure water supply are not now tolerated as they were at one time, and that this is due to the persistent work of the health association. It also shows that the fundamental principles of sanitary science are much better understood than they were a few years ago. There is no one paving material which possesses every quality desired in a pavement to meet all conditions and uses. The ideal pavement remains to be discovered. It should be cheap and economical of maintenance; it should be durable and suit all classes of traffic; it should offer little resistance to traction; it should give a good foothold to horses; it should be adapted to all grades; it should not be muddy or pervious to water, and, above all, it should be sanitary—that is to say, non-absorbent, not subject to decay, easily cleaned, not dusty, and not noisy.

It will be readily seen it would be very difficult to find a pavement which would come up to all these requirements. The primary intention of the pavement is to accommodate travel, and to provide one which would do this satisfactorily—which will be durable, cheap, and of good appearance, and be even and smooth—this is the difficult problem which presents itself to the paving engineer. Just as no absolutely perfect pavement for every time and place has been discovered, it is doubtful if any paving material now used should be utterly condemned. Each has its place in which, until the ideal useful pavement is found, it will be more satisfactory than any other which could be used under that particular set of conditions of soil, climate, traffic, etc.

Of all pavements, cedar blocks have received the greatest censure, on the score of unhealthfulness. Such blocks, laid endwise, not only absorb water, which dissolves the albuminoid matter, which acts as a putrefactive leaven, but also absorb much of the horse manure. The lower ends of the blocks rest on boards, clay, or sand, soon become covered with a fungoid growth, thoroughly saturated with albuminous extracts and the excreta of animals in a liquid putrescible form. These wooden pavements undergo a decomposition in the warm season, and add to the unwholesomeness of the city. Abroad, however, many of the pavements are karri and jarrah woods of Australia, which are thoroughly saturated with resins, so that they are very hard and not subject to decay. They are sawed into brick-like blocks and laid in concrete. They are much more carefully prepared than the blocks used in America. Here the round blocks are of irregular diameter, and are merely untreated wood still carrying the bark. With no preservative treatment, they are enabled to absorb, to the fullest extent, all forms of liquid street filth, which, in progress of putrefaction, feeds on the organic matter of the wood. The surface quickly becomes uneven, and the whole gives rise to noxious odors. From a scientific standpoint the cedar block pavements of this country would indicate a serious menace to health; but, however, these objections are largely theoretical. There do not appear to be any statistics to prove that the conclusion is a correct one. The death rate of cities most largely paved with cedar blocks does not bear any ratio to the extent of such pavements; nor does a change from cedar blocks to any less absorbent pavement produce a noticeable effect on the death rate. The foreign woods are now used to some extent in this country with very satisfactory results. A Polish scientist has recently made some experiments on the bacteriology of cedar blocks. These experiments show that in specimens taken from blocks which have been in use for four years, and from a depth of one centimetre and two centimetres below the surface, there were, at the end of five days, 650,000 and 220,000 bacteria per gramme of wood. A later examination showed 1,200,000 colonies per gramme in the surface of the wood, and 8,600 colonies per gramme at two centimetres below the surface. An estimate, in terms of its nitrogen, was made of the organic matter absorbed by the wood, and indicated that the surface layer of wood contains more nitrogen than the most polluted soil. A comparative estimate of the pollution of the atmosphere was made by placing a definite quantity of sulphuric acid on a bell glass on the surface of wooden and asphalt pavements, the result, as indicated by the quantity of ammonia absorbed by the acid, being much in favor of the asphalt. The observation shows that, while a wooden pavement gives absolute protection to the soil and the subsoil, there is considerable atmospheric contamination.

Broken stone or macadam would next arouse suspicion with regard to its absorptive qualities. There is this great difference between the two, however: that whereas a wooden pavement itself decays, and affords food for the decay of other organic matter falling on it, the macadam does not, in itself, decay. With under-drainage, such as well-built macadam roads possess, it should be little more than a good sewage-disposal bed for the comparatively small amount of sewage which falls upon it. A macadam pavement can be scraped and swept; it is not noisy; dust can be subdued by sprinkling, and on sanitary grounds it appears to be an excellent pavement for residential streets, where traffic is not excessive. For business streets, or very heavily traveled thoroughfares, a harder surface is advisable.

With regard to absorption, there can be no objection to asphalt, vitrified bricks, or stone blocks, provided they are properly joined together. Asphalt is impervious to water, while the joints of brick or stone pavements are practically perfect as far as absorption is concerned. To be sanitary, pavements should not be dusty. The dust of a pavement is not only an irritant, but it carries with it bacteria of disease, which, from various sources, are a part of the street filth. To prevent dust the pavements must be so perfectly clean that a practically harmless amount is taken up by the wind; or, if perfect cleanliness is not possible, the dust must be subdued by sprinkling. Unless perfectly clean, asphalt pavements are very apt to be disagreeably dusty on a windy day in summer. This is one of its greatest faults, from a sanitary standpoint. Asphalt has the disadvantage of being a very hot pavement. Its smooth surface reflecting back the heat and light, is productive at times of sunstroke, and the glare is frequently painful to the eye. This is more noticeable in closely built business sections, where there is the least circulation of air. Vitrified brick and stone block pavements are neither so hot nor dusty as asphalt, and sprinkling is, in a greater measure, effective in subduing dust on these pavements. Brick and stone pavements are noisy, however, which is an unsanitary feature. This is possibly the most objectionable feature. From what has been said, it will be seen that, on the whole, the selection of a pavement depends largely upon the locality where it is to be laid.

THE TRADE OF ART DESIGNING.

Hundreds of young women art students have in constant view self-maintenance. The majority are soon brought to recognize the fact that it is only possible to obtain liberal self-support by means of art when the women are exceptionally placed or are endowed with exceptional gifts. Others naturally turn to designing as a means of utilizing what they have learned, and many succeed in making a satisfactory living at it. There are, briefly speaking, two classes of professional designers—the general designer and the special one. Of course, the career of the general designer is the one most eagerly coveted by the art student, because it is more varied, and at the same time it is one which requires a greater amount of technical knowledge than the average student can acquire in two or three years of art study. The general designer must thoroughly master the whole history of decorative and applied art in all periods and styles. He must be able to compose decorative designs successfully for wallpaper, furniture, or the cover of a book. As a rule, the art education of women is not brought to a point to fit them to be competent general designers, and, in fact, as Mrs. Candace Wheeler has well remarked, there are not so many successful women specialists as there should be. They have not yet learned to choose a certain line and pursue it with exhaustive and practical, as well as historical, study in that particular direction. In an interesting letter to the New York Tribune she gives some interesting facts regarding the training of art students. Perhaps the most prevailing idea of design among students is that of combining drawings of plants and flowers into repeating groups for printing upon textiles and wallpapers. The inclination to pursue this line of work is natural, because students are constantly surrounded by wallpaper and printed cloths, and have not yet learned to note ornament in other manufactured things. They naturally appeal to the inexperienced students as illustrations appeal to a child. A great deal of artistic ability can be expressed in the design of a wallpaper, but the field is hardly broad enough to admit every student who wishes to become a designer, for the number of paper and cotton factories is limited, and there is great competition in this line of decorative work, so that salaries run from about $10 to $20 a week. One point which Mrs. Wheeler makes is that technical ability alone is worth a salary, and united with artistic ability it is proportionately valuable. Sometimes

the work of a special designer of textiles is frequently lacking in artistic quality. Either more art knowledge and feeling are required or more technical knowledge on the part of the student before the best artistic results come to the public or pecuniary reward to the designer. If a student wishes to secure steady employment he or she must take a leaf out of a specialist's book, and must not only be able to fit their own designs to the machinery used, but devise others as well. They must learn the capacity and variety of printing machines; they must learn what they can not as well as what they can do, and understand the economic advantages of certain processes over others. Unfortunately, a great deal of drudgery is at present indispensable in working for the manufacturer.

In other lines of design technical knowledge is not so imperative—that is to say, a greater familiarity with style, based upon a sensible understanding of methods of application of ornament to material, will go further than much technical knowledge without style. For instance, a designer of silverware or metal of any kind must know how the best effect can be produced upon the material, but his designs are not so hampered by the laws of repetition and space as when applied to textiles or wallpaper.

COURSES IN GARDENING.

The Institute of the Missouri Botanical Garden, St. Louis, Mo., offer theoretical and practical instruction for young men desirous of becoming gardeners. It is not intended at present that many persons shall be trained at the same time, nor that the instruction so planned shall duplicate the excellent courses in agriculture now offered by the numerous State colleges of the country, but it shall be quite distinct and limited to what is thought to be necessary to train practical gardeners. After admission the pupil must devote his entire time and energy to the labor and studies prescribed for him. A number of scholarships are also provided. Students may also enter in April on payment of the tuition fee after examination. They are only received on condition that they shall complete the full course of four years' work. The garden has a library of 13,000 volumes and 19,000 pamphlets, relating to all branches of pure and applied botany. The studies include entomology, bookkeeping, surveying, arboriculture, landscape gardening, botany, vegetable gardening, botany of fruits, garden accounts, botany of house plants, forest drainage, small fruit culture, special gardening, vegetable physiology, botanical geology, botany of weeds, woody plants, etc. All of the above subjects capable of being taught in the laboratory greenhouse and the field are so taught, and all of the theoretical instruction is expected to be practically tested in the performance of the manual of work required of the students, the object being to make practical gardeners and not botanical or other scientific specialists of the garden pupils. There is certainly a field for scientifically educated gardeners at the present time.

A UNIQUE PHILADELPHIA BALLROOM.

The most unique ballroom in the American continent is the Empire room, in the newly completed west wing, or addition, to the palatial residence of Edmund Lewis, Esq., the artist, in Philadelphia, illustrated above and on page 19. Apart from the character of this dazzling interior as a work of art, a personal interest attaches to it that gives it a distinctive value, in the estimation of workers with the brush or pencil, not possessed by other additions to the houses of American millionaires. This special interest springs from the fact that Mr. Lewis himself has imparted the rich decoration shown in the interior, and his deft brush has lent additional lustre to portières and furniture. As the house originally stood, a yard, or garden, extended some fifty feet or so beyond the west wall. This wall was pierced with two bay windows, one lighting Mr. Lewis' studio, the other his library. In the former yard, Mr. T. Mellon Rogers, a Philadelphia architect, has erected the wing of which this beautiful ballroom is the main feature. Mr. Rogers was structural engineer, Mr. Lewis decorative artist. The spaces originally occupied by the two bay windows now constitute entrances to the ballroom. The dimensions of this apartment are a width of forty-six feet, a depth of thirty feet, and a height of twenty feet. The spacious entrances to it are flanked, on either side, by two Corinthian columns, highly ornamented with relief work in the Empire style. Pilasters, on both sides of these entrance doorways, are decorated with festoons of pendants and ram's head ornaments. From brass poles, or rods, over the doorways, are suspended superb portières of yellow satin, adorned by Mr. Lewis with flower designs of great beauty and in imitation of old Empire brocades. Spaces in the wall, above the portières, and the medallions which crown them, are specimens of decorative work by Mr. Lewis. The general effect of architectural ornament throughout is of golden designs on an ivory background. The central space of the western wall, directly opposite the entrances, is a huge fireplace, containing andirons and massive logs. This is surmounted by a splendid mantel, in which is inlaid a medallion of "Aurora," gilded, her glowing locks symbolizing Light and Youth. Above the mantel is enshrined an original "Nativity," by Correggio, a noble work of religious art that once formed a part of the collection of Joseph Bonaparte when residing in Bordentown, N. J., and obtained by Mr. Lewis about ten years ago. The mantel is flanked, on either side, by broad spandrel windows. Each window is fitted with large glass spandrels, with fretwork screens in front. The windows are mullioned with frosted glass. The western wall is broken with Corinthian pilasters, and is hung with crimson tapestry.

A CORNER OF THE BALLROOM.

The groundwork of the paneled ceiling is pale blue, with a dainty border of violet gray and occasional flowers of delicate pink, gracefully distributed. The paneling is of a satin finish, richly gilded. From the central panel is suspended a chandelier of ormolu work and crystal, originally a feature of one of the old Florentine palaces, and dating from 1750. It is made in many branches, and supports a great number of very tall candles. The floor of the ballroom is of short strips of mahogany, laid in staggered rows. In the centre lies an Aubusson carpet, or rug, of passive tints that harmonize well with the decorative color scheme of the architectural work. Several of the chairs are genuine relics of the Empire period, upholstered in yellow brocade of that time. These pieces of furniture formed the models, or study, for Mr. Lewis' exquisite flower designs on the portières, also on the great sofas, richly covered with yellow satin, facsimiles of those of the Napoleonic era. Notable relics of that period are two candelabra, upheld by life-size, gilded cherubs, which flank the fireplace. These striking figures were once the property of Cardinal Fesch, uncle of Napoleon I., and afterwards in the imperial household, at Paris. Another superb piece is a massive vase, three and one-half feet high, made in one of the factories established by Napoleon Bonaparte, and designed to commemorate his victories. The whole exterior of the vase is richly symbolical of the great battles of Napoleon. It rests upon a table elaborately carved. The north and south walls are almost entirely covered with immense tapestries. One, on the south wall, is 10 x 17 feet in size, and is a Flemish work of the fifteenth century. The subject is the "Last Judgment." Beside it hangs a smaller piece, displaying the "Salutation of the Blessed Virgin Mary by St. Elizabeth." On the east wall is a French piece of the seventeenth century, depicting an old château. The largest tapestry in the room is that nearly covering the north wall. It is 13 x 17 feet in size, and comprises nine life-size figures. The subject is the "Judgment of Solomon." The works of art that are hung round on the vacant wall space are of almost priceless value. Among them are the original sketch, or study, of Meissonier for his famous picture, "L'Empereur Napoleon III. à Solferino, 1839," now in the Louvre; a portrait of Isabella of Castile, by Velasquez; a portrait of Earl Tetzel (1611), by Von Horst; a life portrait of Mary Stuart, by Holbein; "A Chevalier," by Van Dyke; a portrait of the Princess Elizabeth, sister of Louis XVI., also one of Louis XVI. himself as the Dauphin; and a portrait of Mrs. Philip Conner, sister of Mr. Lewis, painted when she was a young, unmarried girl and a famous belle and beauty of Philadelphia. The older building adjoining this new ballroom wing, the Oriental room, with its wainscoting of Spanish leather, its faience of rare Japanese and Chinese origin, the countless variety these and adjacent apartments contain of bric-à-brac and choice bits of carving and china, all go to constitute a veritable museum. Paintings of every school of art abound, and rare pieces of furniture, with inlaid miniatures, or otherwise valuable as art work or for their historic associations, are numerous and beautiful.

A RESIDENCE AT NEW HAVEN, CONN.

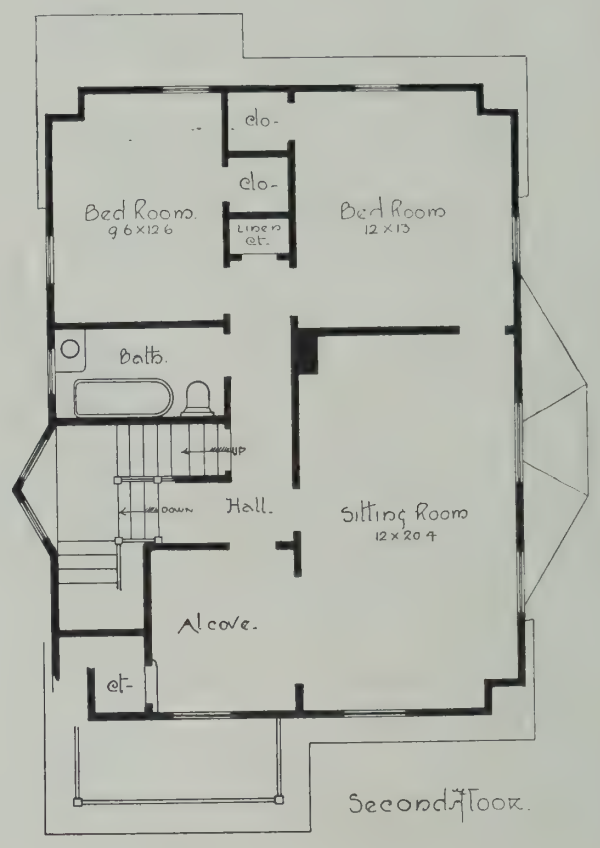
The engravings presented on pages 26 and 27 illustrate a residence, which has been erected for George F. Holcomb, Esq., at New Haven, Conn. The design has many excellent features, including a pleasant piazza, balcony, and several octagonal projections. The underpinning is built of local red sandstone. The superstructure, of wood, is covered on the exterior with shingles, and stained a rich green color, while the trimmings are painted cream white. The roof is covered with black slate. Dimensions: Front, 47 ft. 6 in.; side, 45 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. 6 in. The interior arrangement is most complete, and it is treated in a thoroughly artistic manner. The vestibule is trimmed with oak, and it has a floor laid with tile. The main hall, library, and den are like one large room, the only division being the columns which rise up to ceiling with balustrade effect. The spaces between the columns at the top are provided with spindle transoms. The woodwork is quartered oak. The hall has a paneled wainscoting and beamed ceiling. It has also a nook with seat and a staircase with spindle balusters. The library is provided with bookcases built in and seat. The den, which rises up two steps above the main floor, has a paneled seat across one end of room and a large open fireplace with tiled facings and hearth, and a hardwood mantel. The dining-room has an octagonal projection with seat, and an open fireplace furnished with tiled trimmings and mantel. The butler's pantry and kitchen are trimmed and wainscoted with yellow pine, finished natural, and each apartment is fitted up complete with the best modern fixtures. The second floor is trimmed with cypress, and it contains a large open hall, smoking-room, four bedrooms, large closets, linen-room, and bathroom; the latter is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor is trimmed with cypress, and it contains two bedrooms and ample storage room. Cemented cellar contains furnace, laundry, and other necessary apartments. Mr. L. W. Robinson, architect, No. 760 Chapel Street, New Haven, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN COTTAGE AT HARTFORD, CONN.

We present as our subject for colors, and also on page 22, in this issue, a modern cottage, which has been erected for Mr. Frank W. Hawley, at Hartford, Conn. The design shows a modern up-to-date house, combining all the necessary features to make an attractive and pleasing exterior, and a plan that is commodious and convenient. The underpinning is built of rock-faced red sandstone. The exterior framework is covered with sheathing, paper, and shingles, and is stained with Dexter Bros.' stain of a rich brown color. The trimmings are painted white. The roof is shingled and stained a moss green.

(*Continued on page 34.*)



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A MODERN COTTAGE AT HARTFORD, CONN.—See page 21.

MR. W. H. SCOVILLE, ARCHITECT.

PUBLIC LIBRARY

AN ENGLISH COTTAGE AT LARCHMONT, N. Y.—See page 35.

MR. FRANK A. MOORE, ARCHITECT.

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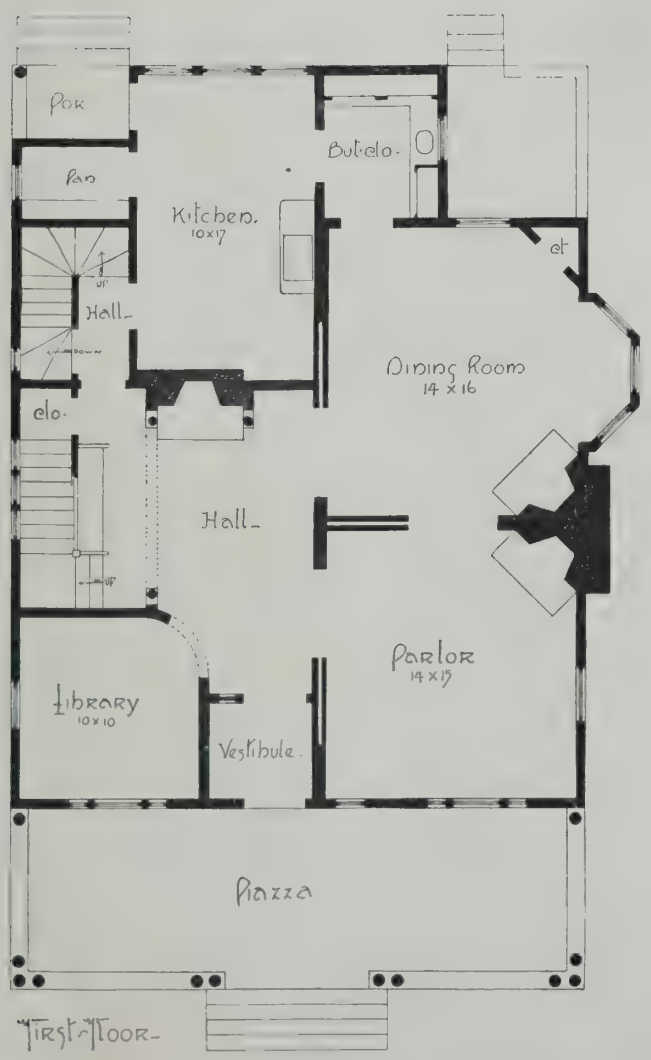
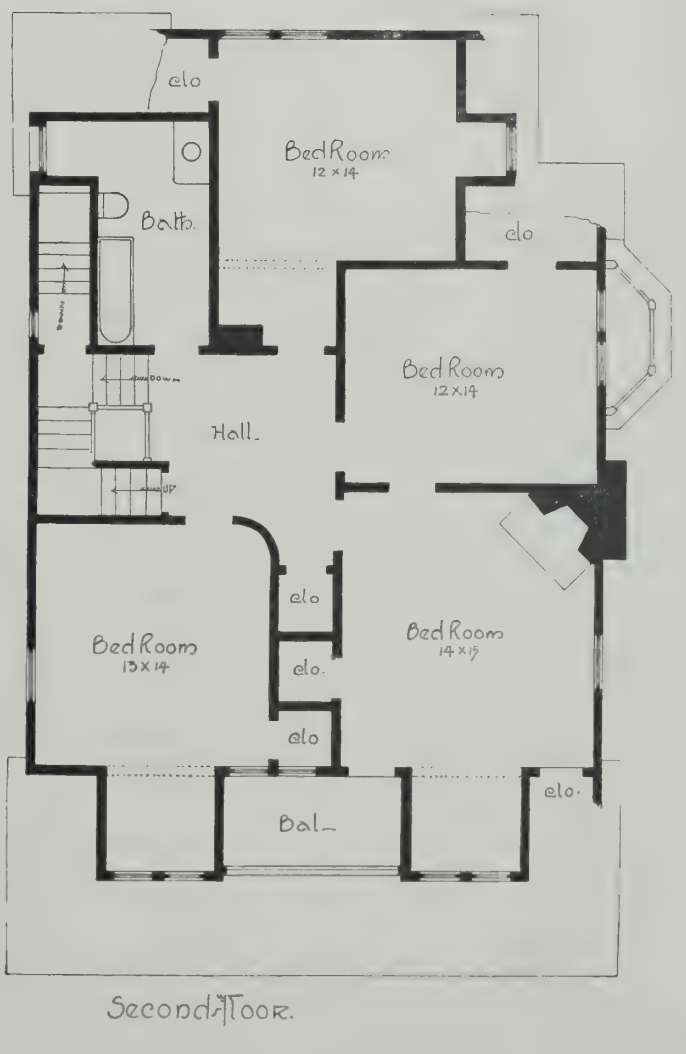
A RESIDENCE AT OVERBROOK FARMS, PA.—See page 35.

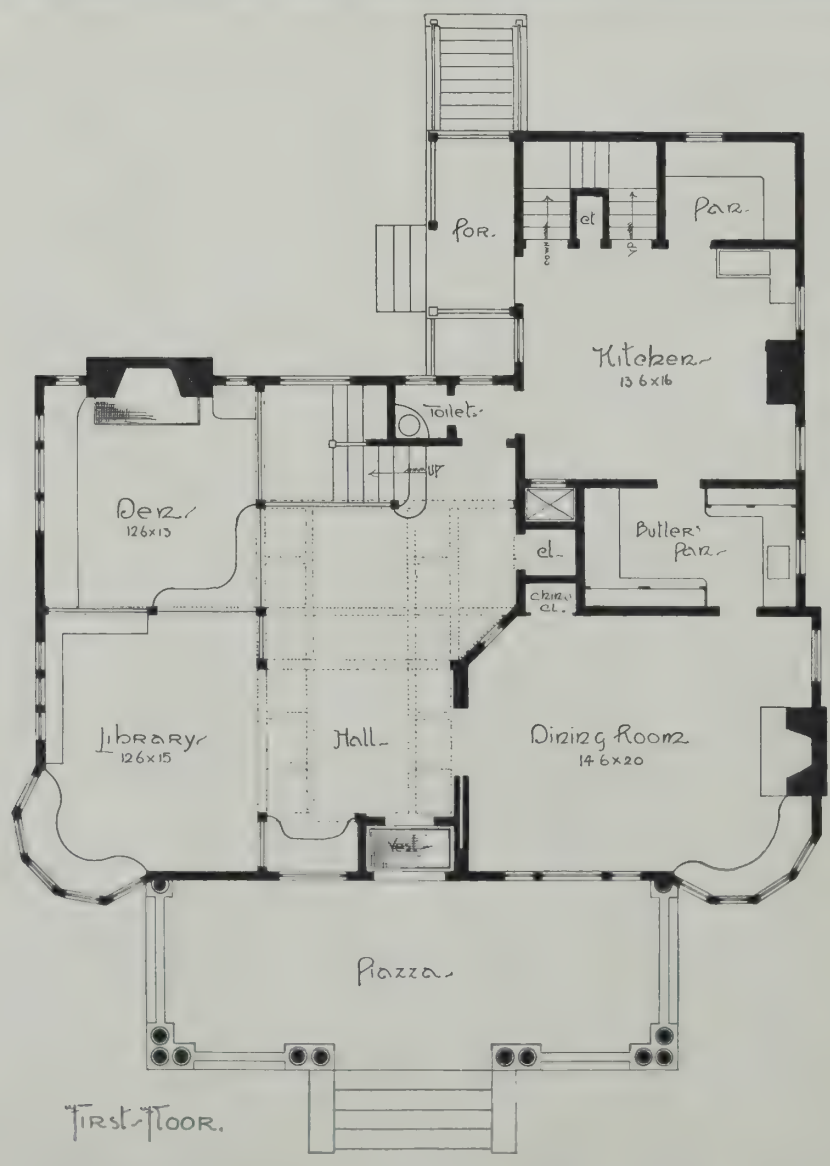
MESSRS. KEEN & MEAD, ARCHITECTS.





A RESIDENCE AT HARTFORD, CONN.—See page 35.

MR WILLIS E. BECKER, ARCHITECT.



A RESIDENCE AT NEW HAVEN, CONN.—See page 21.

MR. L. W. ROBINSON, ARCHITECT.

Second Floor.

A RESIDENCE AT NEW HAVEN, CONN.—See page 21.

MR. L. W. ROBINSON, ARCHITECT.

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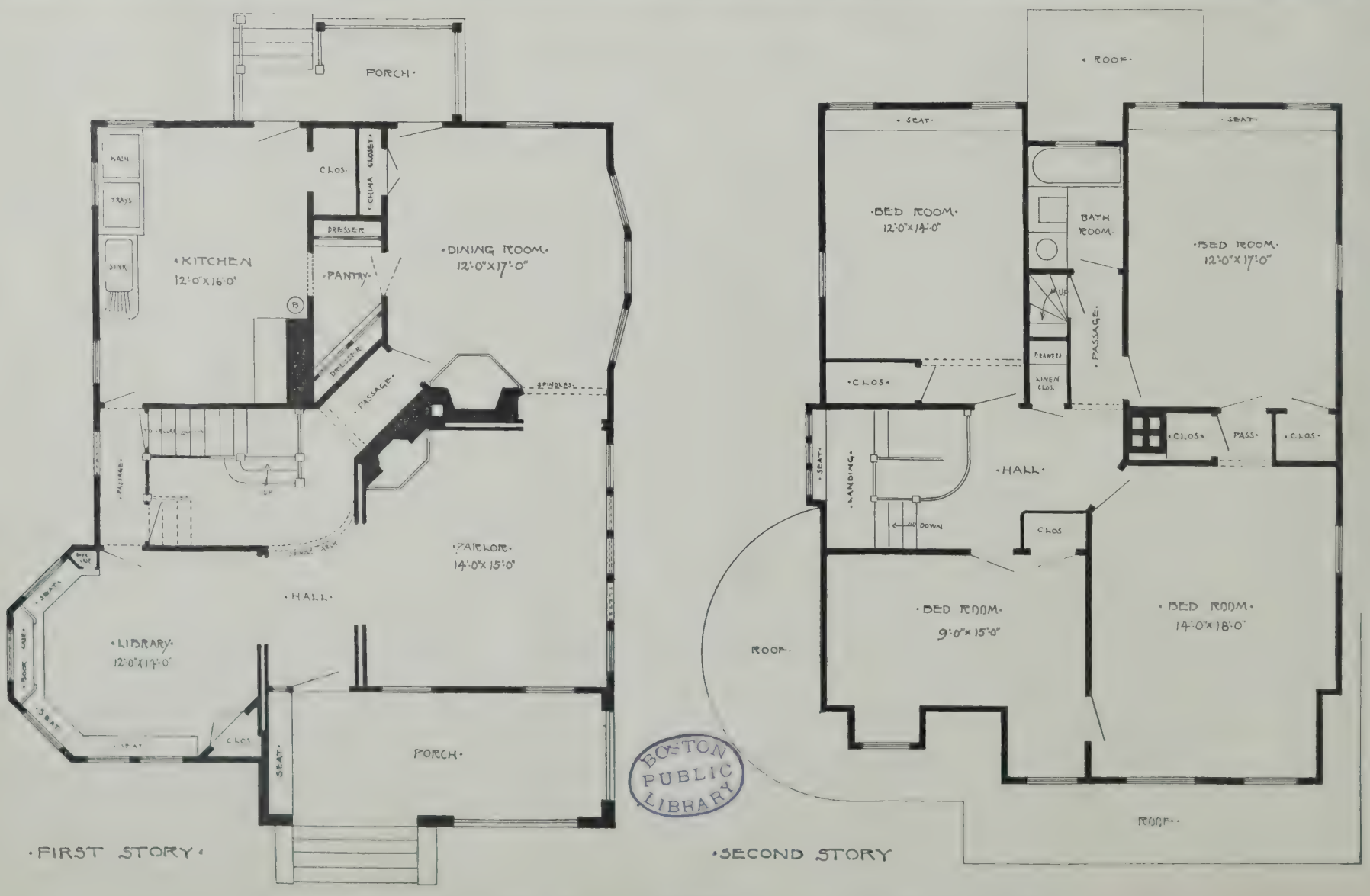

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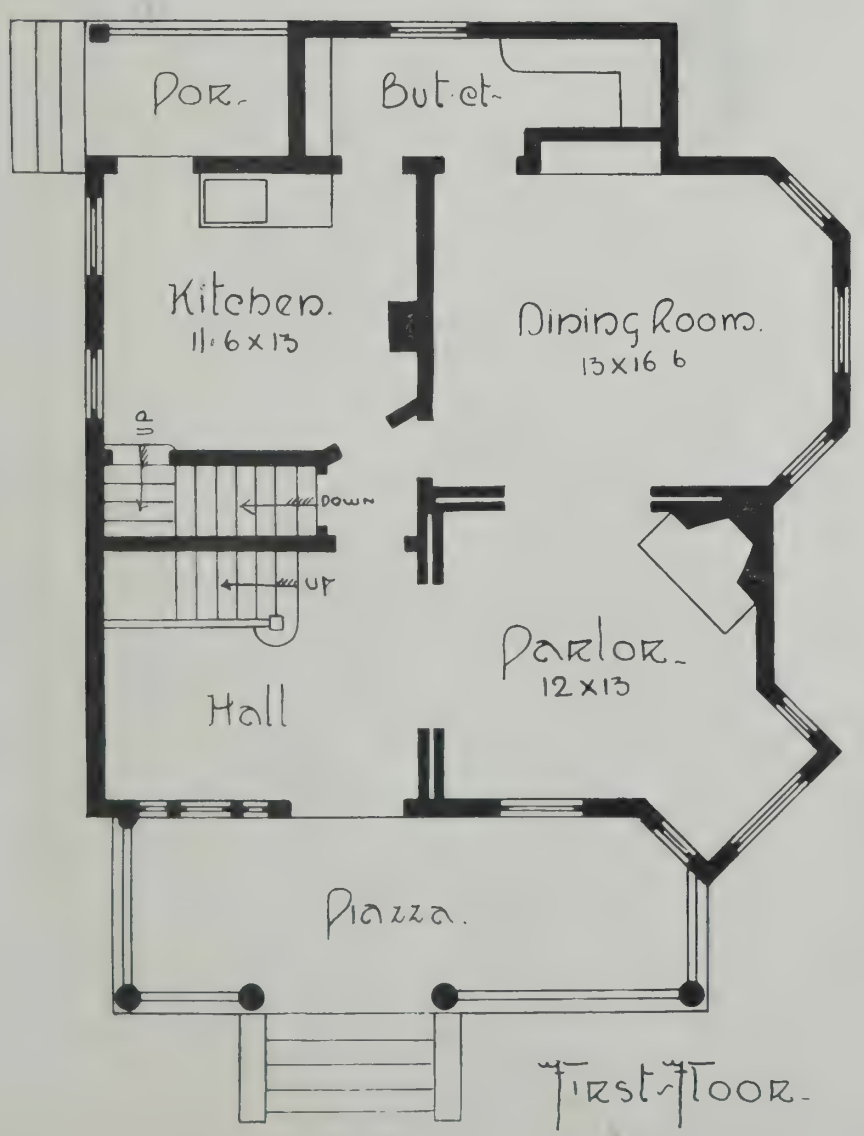
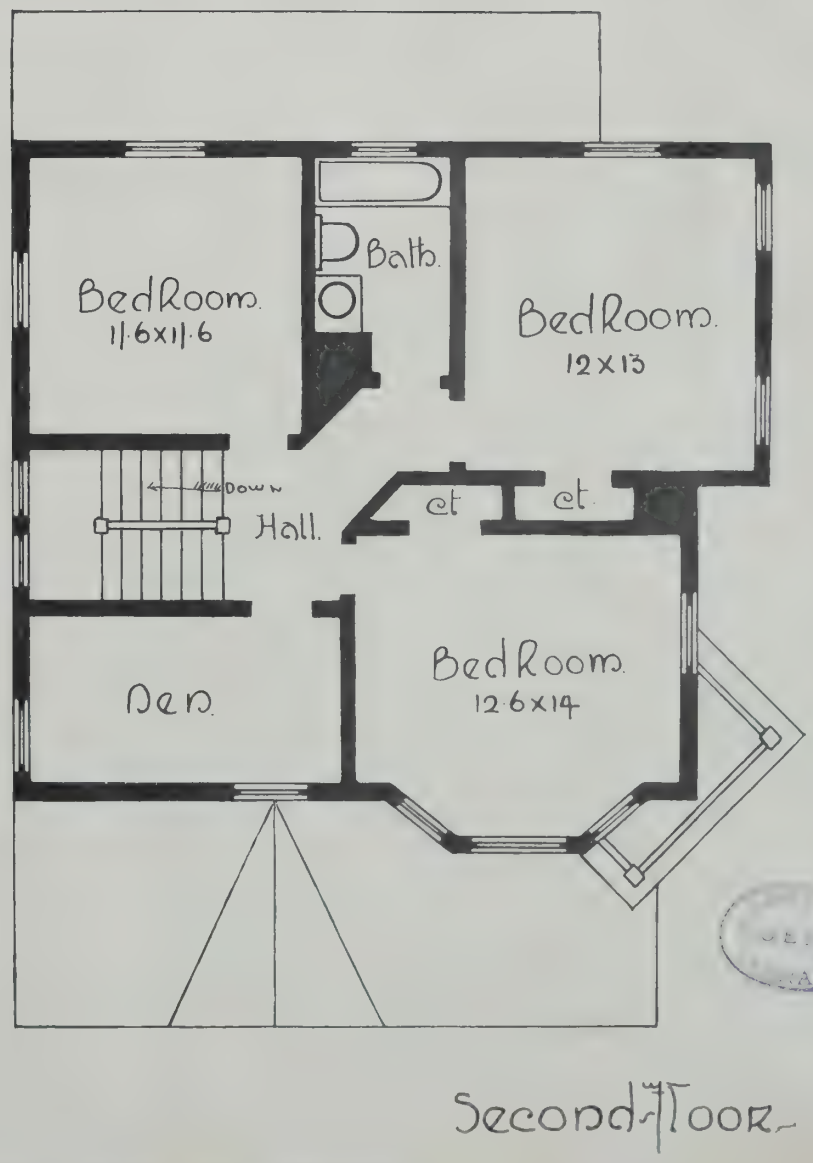
A MODERN DWELLING AT FOREST HILL, N. J.—See page 34.

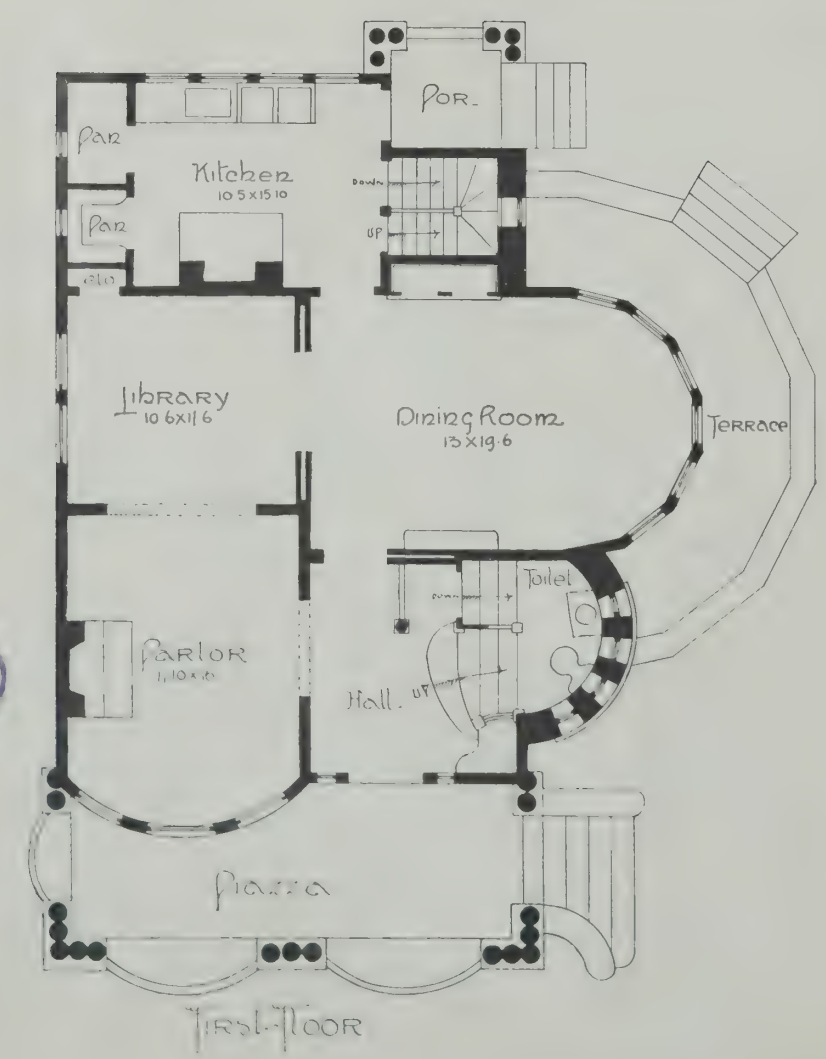
MR. CHARLES P. BALDWIN, ARCHITECT.

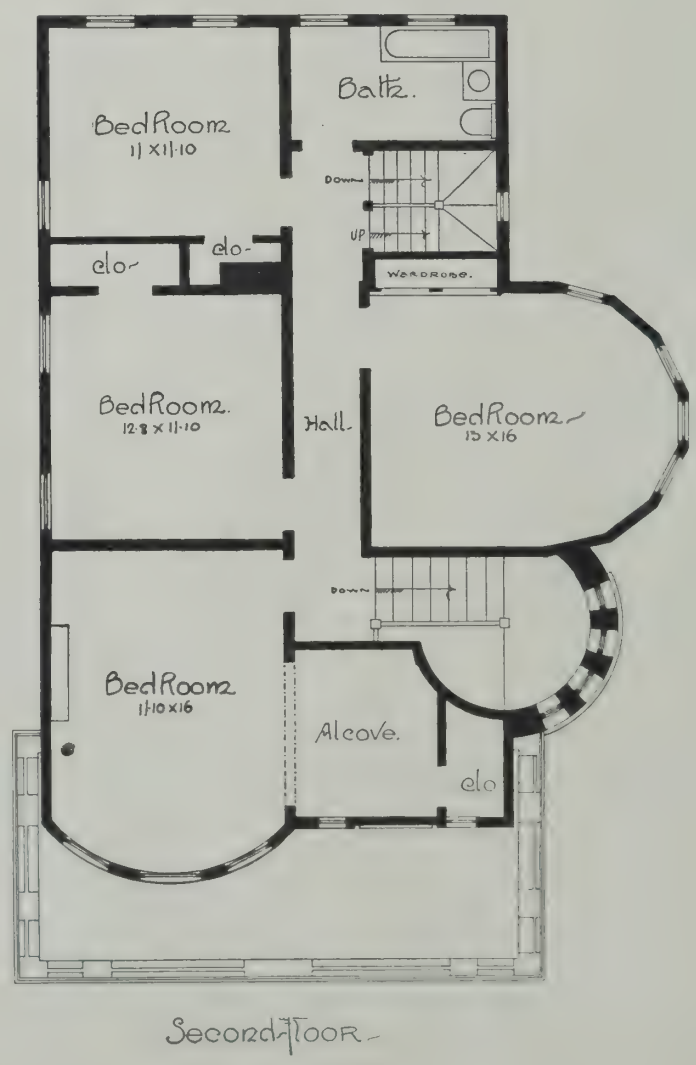




A MODERN DWELLING AT SPRINGFIELD, MASS.—See page 34.

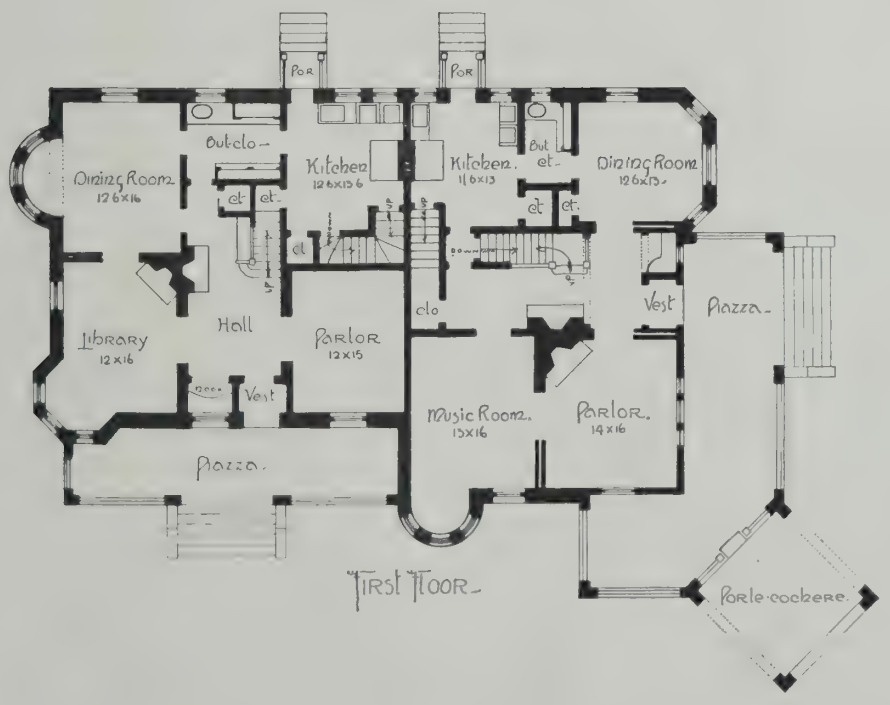
MR. F. W. LATHROP, ARCHITECT.

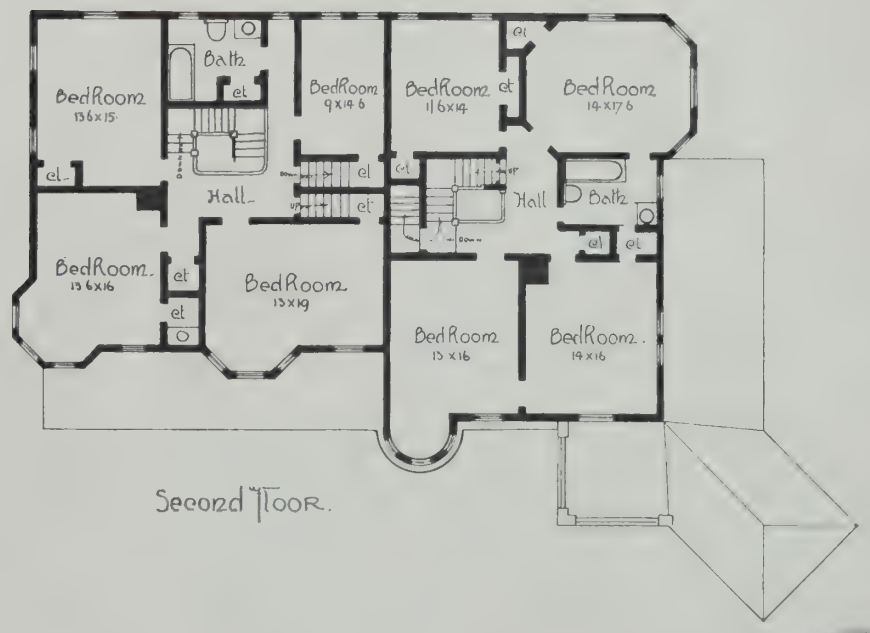




A RESIDENCE AT PARK HILL, N. Y.—See page 35.

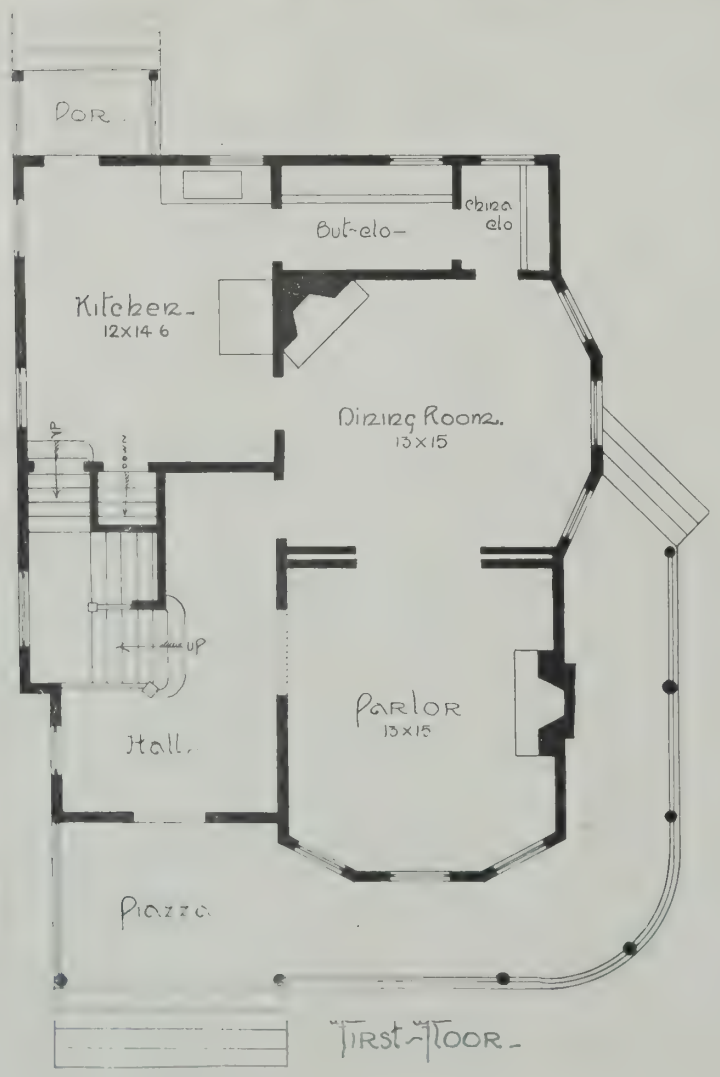
MR. A. F. LEICHT, ARCHITECT.

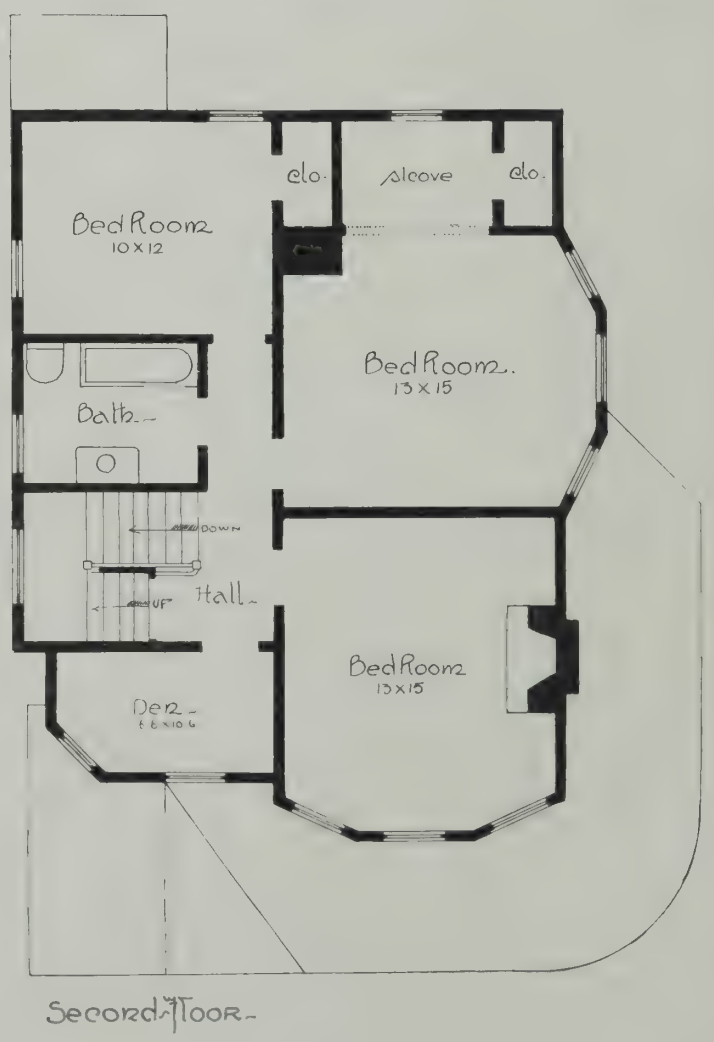




A PAIR OF SEMI-DETACHED RESIDENCES AT PROSPECT AVENUE, HACKENSACK, N. J.—See page 35.

MR. WILLIAM A. LAMBERT, ARCHITECT.





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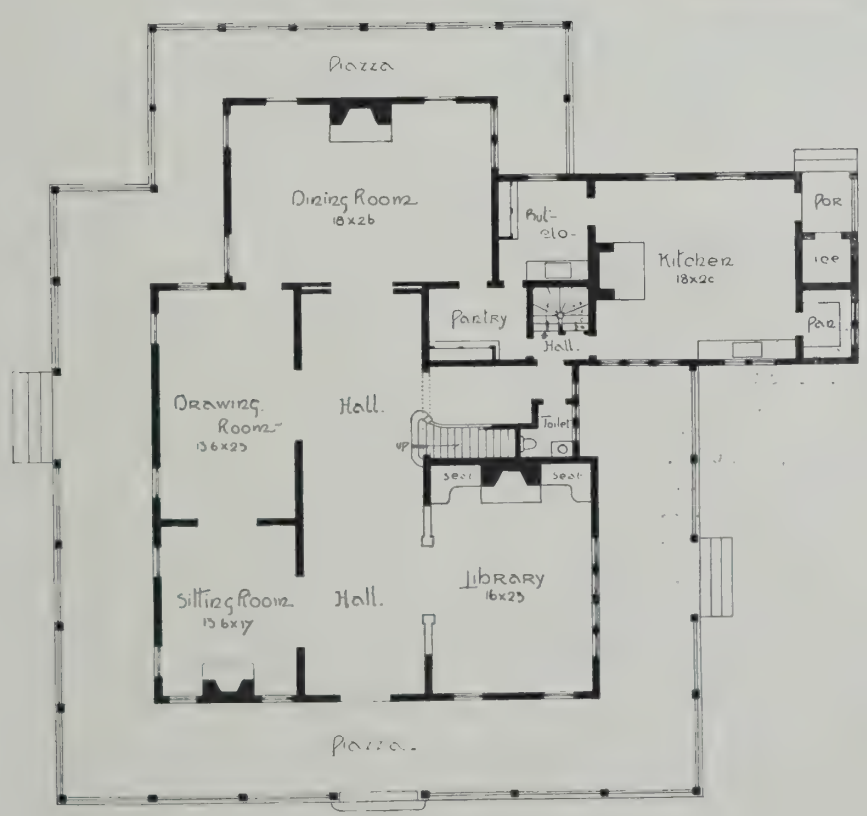
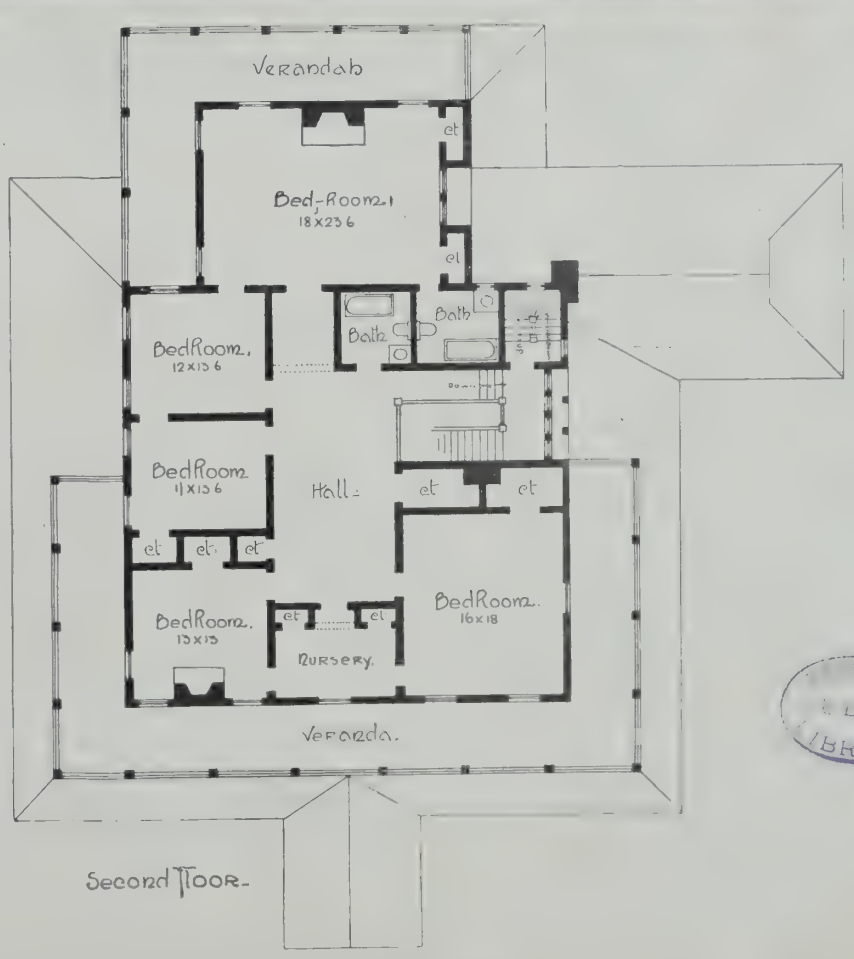
A MODERN DWELLING AT BRIDGEPORT, CONN.—See page 34.

MR. ALFRED H. BEERS, ARCHITECT.





A SUMMER RESIDENCE AT WEST END, LONG BRANCH, N. J.—See page 34.

COTTAGE OF THEODORE SELIGMAN, ESQ.

A MODERN COTTAGE AT HARTFORD, CONN.

(*Continued from page* 21.)

Dimensions: Front, 28 ft.; side, 33 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The first story is finished in brown ash. The hall contains an ornamental staircase with newel, posts, and balusters, and a stained glass window on landing. The living-room, of large dimensions, has a bay window thrown out at side, and an open fireplace, with narrow glazed tiled hearth and facings, and mantel of oak of colonial style, and supported upon fluted columns. The dining-room, at the rear of the living-room, has a bay window and a china closet connecting with pantry. The floors of hall and dining-room are of oak. The kitchen and its dependencies are wainscoted and fitted up with the best modern conveniences. The lobby is large enough to admit ice box. The second floor is trimmed with whitewood, and it contains two bedrooms, sitting-room with large alcove, and bathroom, the latter being wainscoted and furnished with the best modern fixtures and exposed plumbing. The third floor contains one bedroom and ample storage room. There are hardwood floors on first floor, and the house is artistically decorated. Combination and electric gas fixtures are in all the rooms. The cemented cellar contains a Richmond hot air furnace, laundry, and other necessary rooms. The cost, including furnace and everything complete, ready for occupancy, was $4,000. Mr W. H. Scoville, architect and builder, Hartford, Conn.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT BRIDGEPORT, CONN.

We present, on page 32, in this issue, a modern dwelling, which has been erected for Messrs. Marsh Brothers, at Bridgeport, Conn. The engraving shows a good example for a modern dwelling, with many attractive features and a well-arranged plan. The building is constructed of the best materials and in a thorough, workmanlike manner. The underpinning is built of rock-faced bluestone. The building above is constructed of wood, with the exterior covered with clapboards and painted pearl gray with white trimmings. The roof is covered with octagonal cut slates. Dimensions: Front, 28 ft.; side, 30 ft., exclusive of piazza. Height of ceilings Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior throughout is trimmed with whitewood. The hall contains an ornamental staircase turned out of oak, with window, at side, of stained glass. The parlor and dining-room are separated by double sliding doors, and each has an open fireplace trimmed with tiled hearth and facings, and mantel. The kitchen is wainscoted and trimmed with yellow pine, and is fitted up with ample closet and pantry room. The rear stairs are to the main landing of front stairs. The second floor contains a den, three bedrooms, and bathroom, the latter wainscoted and furnished with the usual fixtures and exposed plumbing. The third floor contains two bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $3,000, including everything complete. Mr. Alfred H. Beers, architect, P. O. Arcade, Bridgeport, Conn.

Our engraving was made direct from a photograph of the building, taken specially for the Scientific American.

A MODERN DWELLING AT FOREST HILL, N. J.

The engravings illustrated on page 28, in this issue, present a design for a modern dwelling, which has been erected for Mr. R. W. Bury, at Forest Hill, Newark, N. J. The design presented has many excellent features, including ornamental gables, a graceful sloping roof falling down to and forming cover for piazza, which is well shaded. The underpinning is built of field stone laid up at random, with joints made with colored mortar. The superstructure above is sheathed and papered on the exterior framework, and is then covered with shingles stained an old gold color, while the trimmings are painted a cream white. The roof is shingled and stained a dark green, and in harmony with the rest of the building. Dimensions: Front, 36 ft.; side, 37 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The interior is trimmed throughout with whitewood, finished natural. The hall contains an ornamental staircase turned out of similar wood, with newel, posts, balusters, and rail. The parlor is treated with china white. It contains an open fireplace trimmed with a tiled hearth and facings, and a mantel treated same as trim, and it contains a cluster of latticed windows. The library is an attractive apartment, and it contains paneled seats and bookcases built in around room. The dining-room is conveniently located, and provided with a bay window at one side, and an open fireplace furnished with tiled trimmings and mantel. The kitchen and its dependencies are conveniently located and are fitted up with the best modern improvements. The second floor contains four bedrooms, with large closets and bathroom; the latter wainscoted and furnished with porcelain fixtures and exposed plumbing complete. The third floor contains three bedrooms and ample storage room. A cemented cellar contains furnace and other necessary apartments. Mr. Charles P. Baldwin, architect, Prudential Building, Newark, N. J.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A SUMMER RESIDENCE AT WEST END, LONG BRANCH, N. J.

A SUMMER RESIDENCE AT WEST END, LONG BRANCH, N. J.

We present on page 33 and above illustrations of the summer residence of Theodore Seligman, Esq., at West End, Long Branch, N. J. The design is particularly attractive, with its graceful roof lines, and is well adapted for summer uses, with its spacious piazza and veranda and its numerous large, airy rooms. The exterior throughout is shingled, and left to weather finish a natural silvery gray color, while the trimmings are painted white. The roof is covered with shingles, and painted with a moss green effect. The blinds are painted bottle green. Dimensions: Front, 59 ft.; side, 70 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior is treated in a very handsome manner. The hall is treated in china white, and it has a paneled wainscoting and ceiling treated in a similar manner, and harmonizing nicely with the deep red furnishing and wall. The staircase is a handsome one, with sweeping steps at bottom, rising up to a platform which is provided with a cluster of small windows. Beneath this stairway a toilet is fitted up with porcelain fixtures and tiles. The drawing-room is treated with china white trim and walls of old rose, while the sitting-room is treated with sea green walls and china white; the latter has an open fireplace trimmed with tiled hearth and facings, and mantel. The library is separated from the hall by an archway and balustrade, and it has a paneled wainscoting and ceiling, and an open fireplace with tiled hearth and facings, and mantel, and seats on either side. The color scheme white, red, and green. The dining-room is a spacious apartment, and it is treated with white trim and old Delft walls. It has a paneled wainscoting and ceiling, and an open fireplace, broad and wide, with tiled facings and hearth, and mantel. The kitchen and its apartments are well provided with the best modern fixtures complete. The second floor is treated in china white, with walls treated in various colors. It contains five bedrooms, closets, nursery, and two bathrooms, the latter paved and wainscoted with tiling, and furnished with porcelain fixtures and exposed plumbing. There are five bedrooms on third floor. A cemented cellar contains furnace, laundry, and other necessary rooms.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT SPRINGFIELD, MASS.

We present on page 29, in this issue, a dwelling of modern style, which has been erected for Mrs. A. T. Lorimer, at Springfield, Mass. The design is pleasing, and it has many good features for a building of this character. The underpinning is built of red brick laid up in red mortar. The exterior framework is covered with sheathing and paper. The first story is clapboarded and painted a pearl gray, with white trimmings. The second and third stories are covered with shingles and stained a rich brown color. The roof is shingled and painted in harmony with the rest of the building. Dimensions: Front, 31 ft. 6 in.; side, 31 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The first floor is trimmed with oak, while the remainder of the interior is trimmed with whitewood, and the whole finished natural. The

hall contains an ornamental staircase, with newel, posts, and balusters turned out of oak. This hall is lighted by a cluster of windows, glazed with delicate tinted glass. The parlor contains an open fireplace trimmed with a tiled hearth and facings, and a mantel of oak. The dining-room has a nook for buffet, and a large butler's pantry between it and kitchen, the latter being wainscoted and furnished with all the necessary fixtures. The second floor contains a den, three bedrooms, and bathroom, the latter being fitted up with the usual fixtures and exposed plumbing. The third floor contains two bedrooms and ample storage room. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $2,750, complete. Mr. F. W. Lathrop, architect and builder, Springfield, Mass.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT PARK HILL, N. Y.

On page 30 we illustrate the residence of Mr. Charles Sherman at Park Hill, N. Y. The engravings present a design of unusual beauty in treatment and detail, and it is thoroughly artistic in all its features, one with the other. There are many unique features in the design, especially the wavy effect of the shingle work on the exterior, which is quite pleasing. The lookout at third floor is an attractive and pleasing feature and a great convenience. The underpinning is built of Mile Square granite with rock faces; the balustrade and the inclosed wall to staircase are built of similar stone. The remainder of the building is constructed of wood, and it is covered on the exterior framework with sheathing, paper, and then shingles, stained and finished in a silver gray color, while the trimmings are painted gray. The roof is shingled also, and stained moss green. Dimensions: Front, 33 ft ; side, 39 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The hall is very handsomely finished and treated. It is trimmed with oak, and it contains a grand staircase, with newel, posts, balusters, and rail turned out of similar wood. This staircase has broad steps and landing, seat at side, and column rising to ceiling and forming an alcove to entrance going to the toilet beneath stairs, which is fitted up in a most perfect manner. This hall has a paneled wainscoting. The parlor is also trimmed with oak. It contains an open fireplace furnished with a tiled hearth and facings, and a mantel of special design. The library is an unique department, and is separated by an archway, with transom effect. The dining-room is a very large room, and it is trimmed with oak. It has a paneled wainscoting, and a mantel at one side, while a buffet and china closet combination is built in on the opposite side of room. The kitchen and pantries are trimmed and wainscoted with North Carolina pine, finished natural, and furnished with the best modern conveniences. The second floor is trimmed with white pine, and it contains four bedrooms, closets, alcove, and bathroom, the latter being tiled with white enamel tile, and fitted up with porcelain fixtures and exposed nickelplated plumbing. The third floor is open, but several bedrooms could be finished off if desired. Cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $6,000, complete. Mr. A. F. Leicht, architect, No. 99 Cedar Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A PAIR OF SEMI-DETACHED RESIDENCES AT PROSPECT AVENUE, HACKENSACK, N. J.

We present, on page 31, a pair of semi-detached residences, which have been erected recently for Mrs. Martha E. Smith and her son, Mr. Walter B. Smith, at Prospect Avenue, Hackensack, N. J. The design presented is an admirable one for a two-family house, and it is treated in a pleasing style of architecture, and contains many excellent features, including spacious verandas, balconies, bay windows, and towers, and also porte-cochère. The underpinning is constructed of Paterson brownstone, rock-faced, and ashlar pointed in black mortar. The walls of second story, and also gables and roof, are shingled and finished natural, and the trimmings are painted white. Dimensions: Front, 75 ft.; side, 48 ft., exclusive of piazzas. Height of ceilings: Cellar, 7 ft.; first story, 10 ft ; second, 9 ft.; third, 8 ft. The main halls and staircases are special features of the interior. These halls and vestibules are trimmed with ash. The fireplaces in halls are of brownstone, with ornamental newels. The staircases, of handsome designs, have spiral balusters, fluted columns, and rail. Each hall has a cozy nook with seats and fretwork grilles. The parlors are treated in white, and have an excellent color scheme. The libraries are trimmed with oak, and have open fireplaces with tiled hearths and facings, and ornamental colonial mantels. The dining-rooms are trimmed with oak, and treated in a handsome manner. The floors are laid with hardwood. The kitchens and pantries are trimmed and wainscoted with white pine, and are furnished with the usual fixtures and apartments of the best improved kind. The second floor contains four bedrooms and bathroom in each house. The bathrooms are wainscoted and furnished with the best sanitary plumbing. The third floor of each house contains three good-sized bedrooms. A cemented cellar under each house contains a laundry, furnace room, and other necessary rooms. Mr. William A. Lambert, architect, No. 99 Nassau Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

AN ENGLISH COTTAGE AT LARCHMONT, N. Y.

We present on page 23 an engraving, showing a cottage which has been erected for S. R. Wight, Esq., at Larchmont, N. Y. The design is treated in a most unique manner, with English feeling. It combines pleasing elevations and a plan that is excellent. An attractive feature is a spacious and well shaded piazza. The underpinning is built of rock-faced granite of a bluish gray color. The exterior framework is covered with sheathing, paper, and then shingles treated with bleaching oil and left in their natural state. The trimmings are painted cream white. The blinds are painted bronze green. The roof is shingled and treated similar to main house. Dimensions: Front, 32 ft. 2 in.; side, 48 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The hall is trimmed with pine and treated with china white. This hall has a coat closet, a paneled seat, and an ornamental staircase turned out with newels and balusters, treated same as trim, while the rail is of mahogany. The parlor is treated in china white, and it has bookcases built in, and an open fireplace trimmed with tiles, and furnished with a mantel made from special design. The dining-room is trimmed with cherry, and it has a bay window thrown out at side, a nook built in for buffet, and an open fireplace furnished with tiled trimmings and mantel. The butler's pantry and kitchen are trimmed with North Carolina pine, and each room is fitted up in a most complete manner. The rear hall and lavatory are conveniently located and well fitted up. The second floor is trimmed with pine, some of which is stained white; the remainder is treated in colors. This floor contains four bedrooms, with large closets, dressing-room, and two bathrooms; the latter are wainscoted and painted with china white, and are furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and trunk-room. A cemented cellar contains laundry, furnace, and other necessary apartments. Mr. Frank A. Moore, architect, No. 123 East Twenty-third Street, New York.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT HARTFORD, CONN.

The engravings on page 25 illustrate a residence which has been erected for Henry Souther, Esq., at Hartford, Conn. The design presents many excellent features, and includes a well-shaded piazza, bay windows, dormer, and chimney at side, which is an architectural feature in itself. The underpinning and chimney are built of rock-faced stone of a bluish gray color. The exterior framework is covered with sheathing, paper, and shingles, left a dull brownish color with mottled effect. Roof is also shingled. Dimensions: Front, 35 ft.; side, 41 ft. 3 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The interior is treated in a handsome manner; the entrance is through a large vestibule trimmed with oak. The hall is trimmed with oak, and it contains an ornamental staircase separated by an archway supported on columns. This staircase is turned out of oak, with newel posts and balusters, and it is lighted by a cluster of small windows at side. The library is trimmed with pine, and is treated with white enamel. The parlor and dining-room are trimmed with oak, are separated by double sliding doors, and are provided with open fireplaces furnished with tiled hearth and facings, and mantels of excellent design. The hall has a similar fireplace. The kitchen and its apartments are wainscoted and trimmed with maple, and are furnished with all the necessary fixtures of the best modern kind. The second floor contains four bedrooms, with large closets and bathroom, wainscoted and fitted up with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage room. A cemented cellar contains furnace, laundry, and other necessary rooms, Mr. Willis E. Becker, architect, Hartford, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT OVERBROOK FARMS, PA.

The engravings presented on page 24 illustrate a residence which has been erected for David Pearson, Esq., at Overbrook Farms, Pa. The building is treated in the Spanish style of architecture, and is very pleasing and attractive in its appearance, and it has a spacious piazza. broad terrace, and numerous bay window projections. The underpinning, carried up to sills of first story windows, the balustrade at piazza and terrace, and the front wall of first story, are built of Eastern hydraulic Pompeian brick of a grayish brown color, with Indiana limestone trimmings. The remainder of the building is covered with stucco of a light gray color. The woodwork is painted a very light soft gray tint. The roof is covered with shingles and stained the color of Spanish tiles. Dimensions: Front, 50 ft.; side, 54 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The plan is arranged in a most excellent manner. The hall and staircase are trimmed with quartered oak. The hall has a paneled wainscoting and ceiling beams, and is separated from the library and parlor by columns, forming an arcaded effect. The grand staircase, of handsome design, with newel posts, balusters, and rail turned out of oak, rises to a broad landing, with a bay window thrown out from it and provided with a paneled seat. The lavatory and coat-room beneath stairway is a convenience. The fireplace is furnished with tiled hearth and facings, and a mantel of oak of special design. The parlor is trimmed with white pine, and is treated with china white. It has a seat in bay window. The den is conveniently arranged with private porch, and is trimmed with white pine and stained. The library and dining-room are trimmed with oak; the former has an open fireplace and seats, and the latter a bay window and a paneled wainscoting. The butler's pantry and kitchen are trimmed with white pine. These apartments are furnished with the best modern improvements. The second floor is trimmed with white pine, some of which is treated in colors. This floor contains four bedrooms, nursery, and two bathrooms; the latter are trimmed and wainscoted with oak, and are furnished with exposed plumbing and porcelain fixtures. The third floor contains the servant quarters and other necessary apartments, storage, etc. Cemented cellar contains laundry, furnace, and other rooms. Messrs. Keen & Mead, architects, 1420 Chestnut Street, Philadelphia, Pa.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

Ventilation of Gas-Heated Rooms.

The ventilation of living-rooms is one of the most important subjects with which the human race has had to deal. It is vain to supply a man with good food and pure water if his lungs are obliged to deal with bad air.

Like all other very important problems, this one was solved in a scientific way long before science itself was dreamed of. We can imagine a long and painful series of experiments, guided by no other rule but that of the survival of the fittest, before open fireplace, with its radiant heat and its continual draught of foul air from the floor, became the standard method of heating.

Cost aside, I do not consider it possible to devise any better system of ventilation than is provided by an open fireplace, and the nearer our methods approach to this, the nearer, in my opinion, they come to perfection.

With the introduction of furnace heat, the problem is considerably modified. Large volumes of air, either hot or warm, are admitted into a room and left to chance to distribute themselves. If the fireplace has been left open, the displaced cold air will go up the chimney, and the room be filled from the top with warm, fresh air. This gives an excellent result. If the flue is closed, the expelled air must then trust to bad carpenter's work for its exit, and the result is, of course, problematical.

Steam heat, using direct radiation, again, presents an entirely different problem. The air of the room is heated by a radiator, the chimney usually closed, and but for accidental openings the same air might remain in a room for weeks and be breathed over and over again and gather to itself all sorts of organic impurities. Steam heat, using indirect radiation, is simply a very good hot-air furnace.

When gas heat is introduced, the problem is again modified. Not only must we deal with the vitiation of the air by the inhabitants of the apartment, but we must also take into consideration the fact that the gas heater itself, in most cases, is putting out into the apartment large volumes of carbon dioxide, water, and nitrogen—sometimes less harmless gases—and that it is continually taking from the air of the room the life-giving oxygen, leaving the air to this extent dead and uninvigorating. The products of combustion of any fire are neither more nor less than what the miners call "after damp." That is the gas which fills the mine after an explosion has taken place. For want of any other short expression, I shall speak of them in this paper by that name.

All gas heaters may be divided into two classes. One class sends this "after damp" up the chimney, and the other puts all, or a part of it, out into the rooms. The last class is decidedly the most numerous, and I will first make up the different ways of accomplishing this result.

First of all, there are stoves, radiators, and fires without any pretense of a flue. These are admissible in rooms which are used only occasionally, or which are opened very frequently; or, by providing abundant

ventilation, a fairly good atmosphere may be maintained in any room with this class of heater. For bedrooms, for sitting-rooms, or any other close room where the fire is burned constantly and the windows kept closed, this class of heater cannot be condemned too strongly.

Next comes the heater with the pretense of a flue. I say pretense, because most of the flues provided are totally incapable of carrying off more than a small fraction of the "after damp" and the air that mixes with it as soon as it is formed.

I have seen a gas grate 24 in. wide provided with four ¾ in. round tubes to carry off all the products of combustion. The manufacturer had soothed his own conscience, and the purchaser, no doubt, congratulated himself on the good ventilation he would get; but, as a matter of fact, these tubes are able to carry off less than 4 per cent. of the "after damp" from this fire, and might just as well have been left out altogether.

Another genus of this species of heater provides an ample flue, with a damper to close it. The customer finds by experience that he gets very little heat when the damper is open, and consequently closes it tight, and allows it to rust in that position.

An open gas fire with a real flue—that is, a flue capable of carrying off all of the "after damp"—is a class to itself, and can only be used in towns where natural gas is sold at a low price. It heats entirely by radiant heat, carries a large amount of air up the chimney, and is an excellent ventilator in every respect. It has only one drawback, which is that, as it only utilizes about 15 per cent. of the heat, its use is absolutely restricted to the fields where cheap natural gas can be obtained.

When we come to heaters with real flues, there are very few on the market, but such as there are are rapidly finding favor with the public. Leaving out those which are designed exclusively for the use of very cheap natural gas, the essential requirement of this class of heater is that it shall not only carry off all of its products of combustion, but that it shall provide sufficient radiating surface to abstract from them and give to the air of the room all of their valuable heat before they reach the chimney.—Donald McDonald, in Heating, Plumbing, Lighting.

A Chapter on Carpets and Rugs.

To a home lover there is an instant interest, an affectionate warmth, which kindles and glows when asked to have a brief chat about these delightful fruits of loom and hand. They represent the comfortable foundation of all furnishing; the color-giving, fundamental tone on which all schemes of beauty must be built. The floor covering is the keynote to the color scheme of any room. Custom and modern habit have given pre-eminence and very strong fashionable preference to rugs over a carpet covering for the larger uses in the houses of to-day.

The contention is that they are better from a sanitary point of view, and that they are more easily kept from moths, and generally make it easier to keep a house thoroughly clean. There is a strong pro and con regarding the first claim. They are more easy to be beaten and shaken, if you have the proper person to beat and shake. But if the rug is heavy, and has a deep, soft pile on its surface, the mere hanging it on the rail of a veranda or spreading it upon the grass does not cleanse it, nor does the arm of a young girl, however vigorous, suffice to rid it of dust and grime.

"Art squares" of the light weight generally used in simple bedchambers are less troublesome, and can be fairly beaten and shaken by an ordinary strong woman; but take any form of Oriental rug, or any imitation of their soft, rich, woolly texture, and it is impossible that the feminine idea of a beating is equal to the necessity of the case. They will look very well, and be fresh and bright on the surface, but the first stroke of a carpet cleaner's rod, or the inspection of what is left in the shakers of a steam-cleaning establishment, would reveal much to astonish the scrupulous housewife. To those who have small incomes and no available men-of-all-work to call upon, it is good economy and a very valuable sanitary step to take to have a careful man attend to such rugs once a month.

But the second point urged in favor of an unfastened floor covering, freedom from moths, not only in themselves but in the home in general, we cannot contend against. The crack of space between the wall and the doubled-over edge of a carpet is, no doubt, the Elysian field of the moth tribe. Here is a secure, secluded, dreamy place in which to dose and multiply, and plan campaigns of destruction against everything soft and woolly, and valuable, from a fur boa to baby's winter coat, which the house contains. The rug has the award of merit under this head from every observing housewife.

In the field of beauty it stands confessedly victorious; no textile can be more beautiful than a true Oriental rug, woven in looms with which no European has meddled.

Since England has controlled Indian products, the tender delicacy of color, the wonderful meaningless, yet wholly harmonious, designs have been marred by dyes of European manufacture, and the introduction of figures mathematically grotesque. Shawls have been much injured by this interference, but rugs have been the most seriously harmed.

No floor covering wears as well or tires the eye as little as an Eastern rug; a small one can be bought for a moderate price, even a good large one (not from the rarest and most admired loom) for sixty-five or seventy dollars.

A very sensible and useful rug is to be found in many shops devoted solely to carpets and their substitutes, which is made from remnants of good carpets and borders, and the result is often really beautiful. The best stock of these is generally on sale in early summer.

The improved American "art squares," which, though so called, are often longer than they are wide, are sometimes very subdued and attractive in color. They show strong evidence of study of combinations of wood and wallpapering, and therefore easily enter the unity of a housekeeper's color plan. This year, when green and oak have been so frequently combined, there are some excellent results shown in these rugs. Very good quality, twelve by fifteen feet square, only cost $20; those nine by twelve, $12.

Of the Japanese and Chinese rugs we have little commendatory to say, except for the very best quality of the blue and white cotton; they are invaluable. They especially suit the children's rooms, for they can be scrubbed as vigorously as a bare floor, and, dried in a hot sun, come out as fresh and bright as the day they left the native loom.

One cannot have in the carpet the gem-like blues and reds of a true Persian loom, nor do they show those fascinating curves and scrolls which seem as if they concealed a story from our unlearned eyes. True Indian yellow is not to be produced by mineral dyes, and it is a royally decorative tint, a veritable "high light" in a quiet room; but for an air of tidiness and simplicity give me a well-designed Brussels weave. There is even a perennial youthfulness in the effect they impart, they are so fresh and clean-looking, and respond so nicely to a broom's brisk discipline.

In old days we used to feel that, to use a ridiculous phrase, our "Brussels must be English." The old town which gave its name to the weave had been beaten at its own trade in England. A "five or six frame" English carpet bought in the early part of the century seemed to defy wear. Modern greed for quick production and low price touched even this well-established industry, and the best English is no longer the same article which descended from mother to daughter, and ascended from drawing-room to nursery as it lost freshness.

American carpets, like American blankets, now vie with the best foreign looms, and are very beautiful, and, as a rule, honestly made. There is a difference of only fifteen or twenty cents in the cost per yard, and sometimes their value is entirely equal to the buyer; it is rarely worth the greater price. The best American Brussels costs $1.35 per yard; English, $1.50 to $1.75.

It is a great economy to buy carpet for two or three rooms from the same piece. It is quite a large saving of the first cost if you purchase a whole piece and carpet an entire floor with the same pattern. This, however, becomes monotonous, and takes away individual character from the various rooms; but by buying for two rooms you insure yourself against utter loss by reason of any bad accident, or the harder fate of having to move. In either case the good parts of both carpets can be put together to your great advantage.

The coloring of your room is generally most effective if the carpet is the darker tone, the walls lighter, and leading toward a very light ceiling. Yet a light, cheerful carpet makes a small room look larger than a dark one, and is labor-saving. A uniform dark tint shows every thread and scrap of dust.

To be really beautiful a room should look restful and at peace with itself; it is very easy to make floor and wall and drapery look as if they were mortal enemies. The best-dressed woman never allows her clothes to take precedence over herself; it is she who claims admiration, not her gown. So, in furnishing a room, you have not reached a high artistic point while your friends are at once attracted to the pattern of your carpet or the color of your wall.

Study a good, high-class Persian rug, and see how delightful it is to produce richness by gentle gradations and delicate blendings, and you will reject any of the fanciful contrasting combinations recently so popular.—C., in New York Evening Post.

England as an Importer of Lumber.

England is the largest importer of wood and timber in the world; each year she requires about 300,000,000 feet more than she produces. Formerly she bought largely from us, her purchases coming up into millions of dollars' worth each year. Of late, however, she takes but very little from us comparatively, as we have but very little to offer her now in the timber line. The new tariffs here and in Canada may make some changes in the timber trade. If we are cut off from the Canadian trade by an export duty that the Dominion threatens to place on logs and lumber going to this country, the trade in lumber between England and Canada may be materially increased. Quebec, which at one time was the greatest shipping port in the world for lumber and timber, may secure a part of her departed glories, for Canada still holds by far the largest forest area in existence. Certainly the United States cannot furnish large quantities for foreign export any longer, and if England cannot buy from Canada and other countries the timber she requires, she must depend on her resources. There are extensive tracts of land in Ireland and Scotland that might be profitably devoted to forest culture, and experiments made in the latter country in the growing of spruce have proved that the enterprise was a success in every way. Soon we shall be obliged to pay more attention to forest culture, or future generations will have much to blame us for.—The National Builder.

Hardwood Floors.

The selection of flooring requires intimate knowledge of the fibres, grains, and colors of the various woods; even the different characteristics assumed at the various times and conditions of growth: the colors, as new lumber, sun and kiln dried, and in wearing old age; the usage to which it is to be put must be a prime factor; its price and the ease of obtaining it must not be ignored.

About a dozen families of trees give nearly all the flooring. The two hard pines (*pinus rigida* and *pinus resinosa*) known in lumber yards as Georgia, Carolina, or Southern, are more trod upon in America than any other wood. From them come the oil of turpentine and resin of commerce, by "boxing" the trees, blazing with a cup-shaped hollow at the bottom of the blaze in which the crude resin accumulates. From this the oil is distilled and the residue refined into the clear amber resin. Contrary to general belief, boxing adds to rather than detracts from the value of the wood. By extracting the sap year after year the growth is retarded, and the grain made more compact, finer, and harder. Consumptives seek the piny woods to gain the delicious aroma arising partly from the increased ozone, as well as delight in the dry pine straw upon which to ramble and to loiter—the laziest and most delightful of occupations.

Boards for flooring should be selected entirely from the hearts of old trees. This will cost, when laid, about five cents to the square foot; it is of a light straw color and takes on an excellent polish, is hard but elastic, and makes a good floor for dancing; its unfortunate feature is its proneness to sliver; this can largely be obviated by the way in which it is laid.

Whitewood, or bass (*tilia glabra* of Europe and *tilia Americana* of this country), and ash (*fraxinus excelsior* of Europe and *fraxinus Americana*) cost about the same as the above, but neither is worth considering. The wood is soft, is not pretty, slivers readily, and does not keep its shape under atmospheric changes.

Oak (*quercus alba*, *q. rubra*, and *q. vivens*) markets at about the same figure, and either one of the three mentioned varieties makes an excellent floor. The red oaks, unfortunately, are the ones generally selected. The wood from them makes the homeliest and roughest of the oak floors; the grain is the coarsest, and they stand moisture least well. However, remember that we are comparing oak with oak, and no oak floor is to be lightly condemned. The so-called Spanish oak is the best of the red oaks. It grows in all the lower Allegheny regions. The live oaks and post oaks make light-colored, hard, easily polished timber. But the white oak stands head and shoulders above all the others. It is the lightest in color, hardest, grained closest, and is susceptible of the highest polish; from this comes the finest of the old English black oak furniture: it withstands alike all climates.

Birch (*betula alba* and *b. papyracea*) makes an entirely satisfactory floor for dancing, as well as for kindred uses. It is easily brought to a smooth surface and a fine polish, is of a rich amber color of an even shade, and, in addition, has that rare elasticity and resiliency that make it alike delightful for walking and dancing. It costs about ten cents laid, and is in no way a disappointment to those using it.

What is said of birch applies equally well to hard maple (*acer rubrum* and *a. dasycarpum*), both the white and red varieties, the white being that chosen for floors, it being the lightest colored of the wood so used. It is very hard, takes readily a fine polish; the boards are not liable to warp, but, unfortunately, require the very closest care in the drying to prevent shrinkage when laid. It is lasting, and is but little affected by water. Only beech, hickory, and white oak approach it in lightness of color.

Hickory (*carya alba*, *c. glabra*, and *c. amara*) has too sterling qualities, generally appreciated, to need detailed discussion of its intrinsic worth, yet it is sadly neglected when the question of flooring is under consideration; perhaps that is due to the difficulty with which it is laid. It is an open-grain wood, but takes polish with ease. From the various trees of the *carya alba* are obtained the hickory nuts of commerce; while the *carya glabra* yield the so-called pignuts, and the *carya amara* gives only a small bitter nut that is all but worthless.

Beech (*fagus sylvatica* of Europe and *f. ferruginea* of America) makes almost an ideal floor, light colored and

hard, and has the rare quality of wearing smoother with age; at times it is found beautifully bird's-eyed. In the Southern States it grows in the greatest profusion in the swamps and lower woods, but is unappreciated, only enough being preserved for use in making plane stocks and other tools requiring a hard, durable wood that does not shrink, warp, or split. It could be laid for ten cents. And along with it goes apple (*pyrus malus*), which polishes to a rich, delicate amber color; the cost is about the same as beech, but the apple wood has the tremendous disadvantage of not being obtainable in large boards.

The cherry woods, especially the *prunus Pennsylvanica* (red) and the *p. serotina* (black), are esteemed highly in cabinetmaking, and are equally beautiful and desirable for flooring. The garden cherry (*p. cerasus*) is often used as a cheaper substitute, but can be readily detected by the odor and taste as well as by the general appearance. This is not an ideal wood for dancing floors, but for dining-rooms it cannot be excelled. Both the red and black varieties are beautifully grained, and often can be found curled and even bird's-eyed; neither of these could be laid for less than fifteen to eighteen cents a foot. To properly select the boards, and lay the body of the straight-grained and the border of the curled, nothing could make a prettier floor.

The walnuts are about the same price and wearing value. The black walnuts (*guglans nigra*) of America and *g. regia* of Europe) are the ones best known to cabinetmakers, they being also the hardest and most durable of them, as well as of the richest and darkest colors, that being too well known to require comment. The lighter walnuts, among them the butternuts, have many admirable qualities, and by some persons are chosen for that reason. But of course the general appearance and desirability of the real black walnut cannot be imitated, certainly not excelled, by any wood except mahogany (*swietenia mahogani*), which, being about one dollar a foot, is excluded from the consideration of most persons, and so comment would be needless—except to say that it lacks that elasticity and resiliency so desirable in a floor for dancing.

Now, it is clear from the above that the uses, the furnishing, and the window space of a room should determine the kind of wood to be used.

The laying requires not only a good carpenter, but an expert judge of woods, and of the individual boards, because only by carefully selecting and placing like planks can we get a permanently even surface. Suppose a plank of heart and one of sap should be placed side by side: no matter what the wood, when a rainy season may come the sap will swell more and rise above the heart. Even when they come from like relative positions in two like trees their texture may differ so widely as to make them undesirable companions.

In spite of the nicest workmanship and the best judgment in selecting, some inequalities of surface will be present till removed by the most thorough sandpapering. This should be done with enough care to avoid scratching; then comes the polishing.

It must be remembered that not a drop of water has touched the wood since it left the sawmill, and none must touch it until demanded by soiling incidental to daily use; or, more strictly speaking, none should ever get nearer the wood than the polishing covering it. After the floor is perfectly smooth and free from all stains or dust spots, the following mixture should be applied hot: four ounces of English resin, twelve ounces paraffine, one gallon turpentine. This mixture will make a solution only under heat, and should be applied to the floor as hot as possible with a cloth or brush, or, better still, a felt applicator. After standing a few hours, it should be briskly rubbed with a felt or woolen rubber, and is then ready for use. This protects the wood from water, or whatever else may fall upon it, and also fills in the pores, thus preventing shrinking, which is a very important factor in keeping a smooth floor.

When the floor becomes soiled a warm soapsuds should be the only agent used in cleansing it; then, after allowing it to air well, reapply the above polish. Ordinarily it should be cleaned of dust each day by dry, soft cloths, and gone over with a rubber once a week.

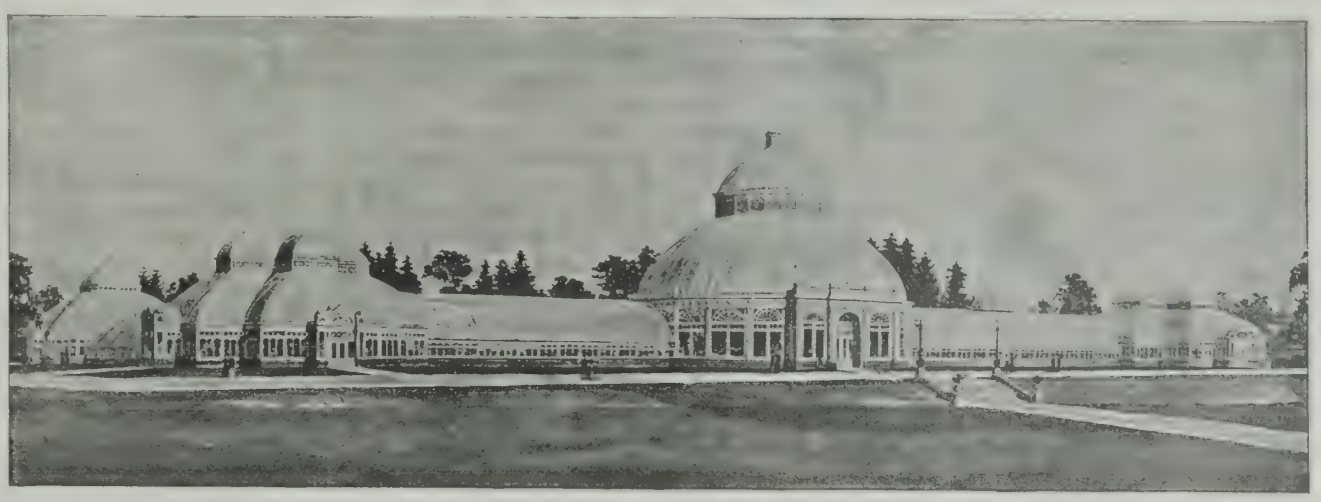
No oil or other grease should, under any circumstances, be put on a floor, no matter what the wood or what the conditions.—EDGAR J. SPRATLING, B.Sc., M.D., in The American Architect and Building News.

THE NEW YORK BOTANICAL GARDEN.

ON Tuesday, January 3, 1899, appropriate ceremonies were held in Bronx Park, New York city, at the breaking of ground for the new horticultural buildings of the New York Botanical Garden, designed by the Lord and Burnham Co., New York, horticultural architects and builders.

About forty-five thousand square feet will be covered by the thirteen different houses, and about one hundred thousand square feet of glass will be required.

The central feature is a palm house 100 ft. in diameter by 90 ft. high. At either side, and extending east and west, are two wings 117 ft. long, connecting at their extreme ends with two conservatories 84 x 84 ft., each having the plan of a Greek cross; the wings are partitioned in the centre to form two distinct compartments.



HORTICULTURAL HOUSE OF THE NEW YORK BOTANICAL GARDEN.

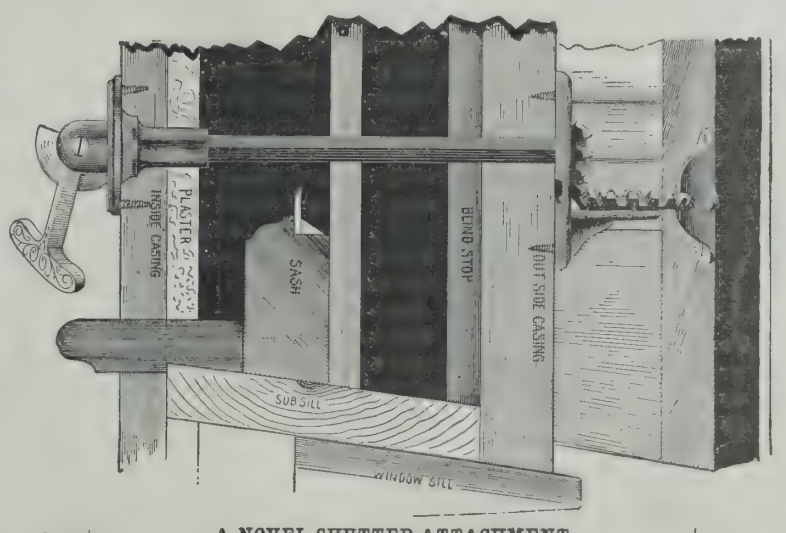
Running directly south from the corner houses are two low lines, each 75 ft. long, which in turn connect two other 50 ft. square houses with cut corners. These latter form the other two corners of the inclosed rectangle. Extending for 100 ft. toward each other from these corners, to complete the fourth side of this rectangle, are two straight houses with octagonal ends. Between the houses is left a fifty foot passage to the inner court, which will be used for the cultivation of aquatic plants and other purposes.

These conservatories will occupy a prominent position on a slight rise above their surroundings. The architecture is largely of the modern Italian renaissance.

A NOVEL SHUTTER-ATTACHMENT.

THE Pitney Shutter Worker Co., of Quincey, Ill., are offering to the public a novel device for opening and closing blinds from the inside of the house, without raising the curtain or opening the window or screens. The device is known as the "Pitney Shutter-Worker."

The shutter-worker is not a toy, but rather a mechanical device of much merit and lasting convenience, readily accomplishing the work for which it is intended.



A NOVEL SHUTTER-ATTACHMENT.

It is the result of many careful experiments, and is offered to the trade as a simple, strong, durable, and convenient article.

The device can be readily attached to old as well as new blinds, and obviates the necessity of opening windows in order to release an obstinate catch. The blinds are locked automatically, both when closed and open, and hence can never slam. The Pitney shutter-worker is novel, perfect, and reasonable in price.

The manufacturers will be pleased to enter into correspondence with builders and architects.

MESSIEURS MERCHANT AND COMPANY, of 517 Arch Street, Philadelphia, Pa., have sent us a most interesting little pamphlet entitled "A Treatise on Tin Plates for roofing purposes, published in the interest of consumers and for the protection of the reputable roofing-plate manufacturers of the United States." The treatise will be sent to architects and builders who are interested in the subject of tin roofing.

A Sculptural Machine.

A SENSATIONAL invention in the field of sculpture has recently been patented, says the Philadelphia Record, by the civil engineer, Alexander Wenzel, of Berlin, who constructed a machine which will carve four, or even six, copies of an original model, turning out real works of art by the wholesale. This machine may be used on either stone or wood. The sculptor now makes a plaster cast, which is placed at one side of the new machine and serves as a guide for a sharp point mounted on a jointed arm. As soon as the one man attending the machine starts up a dynamo a series of four or six tools begins to rotate with great rapidity, making about 2,500 or 3,000 revolutions per minute. The unique arrangement of this machine enables the one handling it to make the tools do the identical work which would otherwise have to be done by the hand of an artist with chisel and hammer. Since the plaster cast is quickly used up, metal casts taken from the plaster figure are made in case large quantities are to be turned out of any one model. The machine is attended by one single operator, who guides the point controlling the rest of the machine over the surface of his model. Besides turning out four or six copies at once, the work is done in one-quarter the time if the material employed is marble, and the result is still more favorable if the copies are carved from wood. The finished copies look very well and the technical execution is perfect. Particularly for relief and medallion work the machine is invaluable. A machine, at work, was exhibited at the Berlin Industrial Exhibition, and turned out marble medallions of Prince Bismarck, which sold at two marks (fifty cents) apiece. If worked by hand, even in quantities, by skilled sculptors, the cost could not have been less than ten marks for such a medallion. The quantity and quality of the work turned out by this machine are truly astonishing, and it must be admitted by a critic that if he did not know that the article had been produced by machinery he could not possibly have imagined that the work under his eyes was one obtained by a mechanical process of reproduction. This machine opens an immense field of decorative architecture, for a wealth of plastic decorations may now be employed, which formerly would have been considered impossible on account of the great expense. Ornamental frieze work, cornices, capitals of columns, and similar architectural ornamentations can be turned out wholesale by the machine alone, while the execution of highly artistic tasks will necessitate the application of a finishing touch by the hand of a professional artist.—The National Builder.

Ebonizing Hard or Soft Wood.

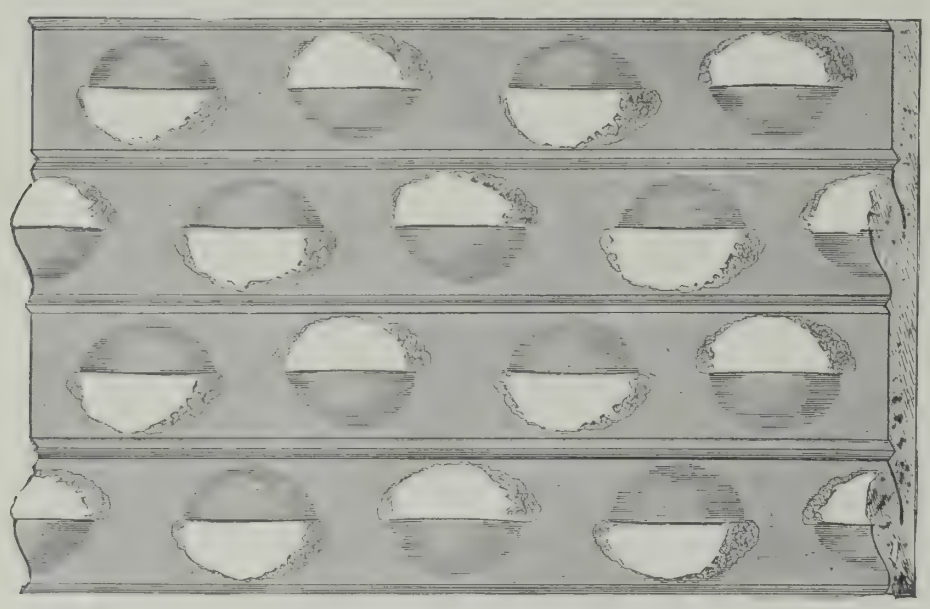
PREPARE some shellac varnish by dissolving half a pound of gum shellac in a quart of alcohol; put in a tightly corked bottle, set in a warm place, and shake frequently. When completely dissolved, add sufficient dry lamp or bone black. It will require only about a heaping tablespoonful to half a pint of varnish. Should it be too thick to flow easily from the brush and spread evenly, add alcohol. Give the wood two or three coats of this, which can be done within two days. For fine work give three coats of the black varnish and allow it to dry thoroughly; then take some 00 or 000 sandpaper and rub the work down lightly until the surface is smooth and even, being careful not to rub through to the wood. Then apply two or three coats more and rub down again with the sandpaper; give two coats more and allow it to dry perfectly hard. Make some rubbers of felt—an old felt hat is good—by tacking the felt on blocks of soft wood of proper shape, which should be flat, concave, or convex to fit the work. Apply a few drops of sewing machine oil to the felt and sprinkle on a pinch of pulverized pumice stone. Rub the work with this, keeping the rubber moist with oil and supplied with the pumice, until the wood shows a perfectly smooth surface, without any gloss. When it has all been gone over wipe off the surface and rub clean with dry flannel cloths. The result is fine imitation of ebony. If the shellac varnish is colored with aniline instead of lampblack, the finished surface is smoother and finer.—The National Builder.

ACCORDING to Lurmann, carborundum (silicium carbide) can be employed as a substitute for ferrous silicium in the production of steel, considerable quantities of carborundum being used for that purpose.

METAL LATHS.

An excellent fireproof lath, fully equal to, and in many respects superior to, any similar lath which has yet appeared, is made by the Curtis Steel Roofing Company, of Niles, Ohio.

The lath in question is made of metal, having slots cut in diagonal rows, the metal on each side of the slot being pressed out in opposite directions to form an opening for the admission of mortar. As these openings are so arranged as to come in pairs facing each other, it is impossible to cover the metal with mortar without causing a perfect binding action. Between these openings, running lengthwise of the lath, are corrugations, each corrugation being on opposite sides of the sheet. These, with the hoods or cups over transversely running openings, render the lath rigid.



BACK OF A CURTIS LATH AFTER PLASTERING.

The accompanying illustration shows the back of the lath after plastering. It is evident how small an amount of mortar is required to produce a powerful binding action

Estimating.

One of the greatest drawbacks the village or country contractor has to contend with is the mysteries of estimating. This does not come because of his inability to "figure up" correctly, but rather because he has no set system to work with, and because he has a vague idea that he ought to arrive at the cost of a building without having to figure out all the details and note the cost of each one. Every editor connected with an architectural journal will know how often the question has been asked of "How can I estimate the cost of a building without being obliged to figure out all the labor and materials required to complete the work?" The question comes to us almost daily, and we can give it but one reply, namely, "There is no possible way of doing it." No "royal road" has yet been constructed on which the estimator can travel without labor to success. Sometimes it may be necessary to arrive, in a few moments, at an approximate estimate of a proposed building so as to give the prospective builder an idea of the cost, and this may readily be done by an experienced builder by comparison. Similar buildings, while they vary in cost anywhere between five and twenty-five per cent., may be used to give an off-hand idea of the cost of a new building, but it must be remembered that in no case should a contractor have his tender for work on the cost of the work already completed. The fluctuation of prices of materials—finished and unfinished—the uncertainty of cost of labor from one year to another, and many other causes that will suggest themselves to the experienced contractor, all tend to make estimating by comparison unreliable.

An approximate figure may also be obtained by the method known as "cubing out." This method is simple and easy, but if employed by the inexperienced and unwary is sure to lead to disaster and ruin, for no method is so misleading as this if the one employing it does not thoroughly understand all the conditions necessary to make the result fairly correct.

In order to illustrate this method let us suppose that a building of a certain class costs a certain sum; then it is quite natural to suppose that another building put up in the same place and at the same time, while labor and materials remain the same in price, the buildings being the same in size and style and finish, that the cost of the second building will be the same as that of the first. While this is not by any means always the case, yet it is a base upon which an approximate estimate may be made. Knowing the cubic contents of the building and the cost of the whole, the matter of getting the cost of a single cubic foot is a simple matter, and when obtained we have a constant figure to work with in obtaining an approximate estimate of all similar buildings, subject, of course, to the conditions previously referred to. It follows, then, that a building double the size of the one figured on would cost double the amount, or, in other words, the cost will be in arithmetical proportions to its size if the same conditions are in evidence, and this unfolds the whole principle of the cubing method.

In discovering the constant figure per foot, it is usual to ascertain the cubical contents of a building by measuring from one-half way up the height of the roof to one-half way down the foundation walls, and multiply these figures by the length and breadth of the building, by feet. Let us suppose a building, for example, to be 30 feet high, 50 feet wide, and 100 feet long, then the formula would read thus: 30 x 50 x 100. This would give us the number of cubic feet in the structure, and having the cost of the building, the process of discovering the figure per cubic foot is within the range of an ordinary schoolboy.

It is quite evident that whatever may be the figure obtained for the single foot, it practically determines the whole result, for by it the cubic contents of all similar buildings must be multiplied in order to arrive at the desired results. It must be understood that a constant figure must be found for each class and each style of building, for it is quite evident that the figure suited to a frame building would not apply to a brick or stone structure, even though the "finish" should be the same. There are also special conditions that may surround like buildings that may affect the cost to a considerable extent, as, for instance, delay in obtaining material, local difficulties of construction, limit of time in which the building is to be completed, which may be set so short that extra expense may be incurred in "pushing" the work, and many other causes, some of which may be in the interests of economy; but in every case the shrewdness of the estimator will be required at its best in order to keep him clear of the rocks of too large or too small a tender.

A good method for a contractor to adopt is to keep an exact amount of the cost of every piece of work he executes, and when he has completed a building it is but the work of a few minutes to figure up and satisfy himself as to the cost per foot, and dot the amount down for future reference. This will help him materially to give a pretty fair "off hand" figure of the cost of any proposed similar building.

In no case, however, do we advise taking a contract on figures obtained by the "cubing out" method, for though such figures may answer a purpose in giving an approximate estimate of the cost of a proposed building, it will be found that the result of a detailed estimate will differ from it very materially—sometimes in favor of the contractor to such an extent that he loses the work because of his figures being too high, and sometimes against him, so that if he gets the work he completes it at a loss of money and labor. Every young and inexperienced contractor should bear this fact in mind, that no estimate can possibly be correct that is not based on figures obtained by actual estimating of everything about the work in detail. An adherence to this rule will save to the country and village, and often city, builder many and many a dollar.—National Builder.

How to Prevent Great Waste of Heat.

A brisk coal fire represents 1200 degrees of heat. From this a current is produced which passes directly up and out of the chimney. Is it a wonder, then, that one-half the fuel is wasted?

Improvements in heating apparatus have nearly all been confined to the different patterns of stoves. The great waste of heat up the chimney either has not been considered or has been given up as hopeless. The Rochester Radiator Co., of Rochester, N. Y., prevent this great waste by having the smoke pass through a radiator with many cross-tubes. Currents of air are thus made to pass rapidly across the smoke in order to cool it quickly, the principle being much the same as that employed in blowing tea.

The Best Period in Which to Fell Trees.

To determine whether a trunk was hewn in winter or in summer is of the greatest possible importance to buyers of timber, especially as regards building timber, as it is a well known fact that timber cut down in summer represents a lower value than that felled in winter. Timber hewn between the months of October and April contains in its cells numerous starch particles which cannot be found in wood which is cut down in summer. Owing to this presence of starch the wood is coarse and impenetrable, since the starch closes the pores. For this reason winter-hewn timber is exclusively employed for staves, for in summer-hewn wood the contents of barrels are subject to evaporation through the pores. The starch contained in the wood is given a violet color by iodine. Should the timber to be examined be coated with an iodine solution, and the surface of the felled side appear yellow, it may be assumed with certainty that the tree was cut down in summer. The light yellow lines are moisture rays, while the cells, tissue, and wood fibres simply take on a yellow covering. In the case of winter hewn timber the amylaceous rays form much darker, ink-colored black stripes on the yellow ground.

Art in Paris Streets.

The blue enameled plates on which the names of the Parisian streets are inscribed have been voted by the Parisian authorities to be too plain, and they are to be replaced with something more artistic. The initiative in the matter is due to M. de Selves, the Prefect of the Seine, who is planning a special commission to be charged with promoting art in the streets. Competitions are to be instituted and prizes offered for gas lamps, fire alarm boxes, letter boxes, advertisement kiosks, public comfort stations, and other necessities of a like order, with a view that they shall all be made artistic. This is certainly very commendable, but unfortunately the authorities have not always been happy, of late, in their efforts toward artistic improvement. For instance, the new copper and silver coins which have just been issued are far from artistic, but these errors are to be rectified.

THE "REX" MOLDER.

The machine illustrated herewith is a new edge-molding or shaping machine, designed for the use of carpenters, cabinetmakers, and woodworkers who desire to finish straight, circular, curved, or irregular work with molded edges.

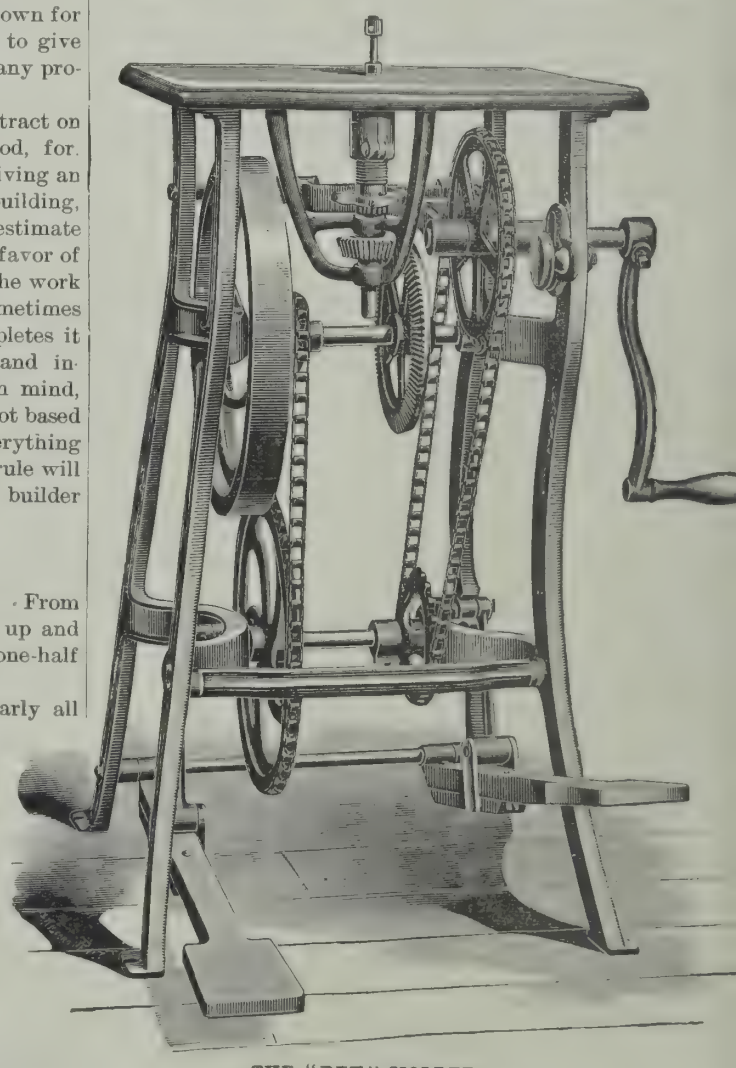
The machine is designed especially for edge molding, and uses cutters up to one-inch face; if desired the spindle can be readily adjusted so as to cut beads, flutes, or other styles of moldings in the centre of a four-inch panel.

The molder is strong and thoroughly made, and has an iron frame, a steel spindle, steel shafts, babbitt metal-lined boxes, and a hardwood table.

The spindle is easily and accurately adjusted up and down, and has adjustable boxes to take up the wear.

The power is transmitted by a chain belt and gears, thus doing away with any slipping or lost motion.

The foot-power has a walking motion, enabling a much greater power to be obtained with less fatigue than with any other kind in use. The operator can run the machine with both feet or with one foot.



THE "REX" MOLDER.

The speed with either foot or hand power is such as to insure smooth, clean, and rapid work.

The molding-cutters furnished for this machine are reversible, and the spindle may be run either way to suit the grain of the wood. The machine is manufactured by the Seneca Falls Manufacturing Company, No. 276 Water Street, Seneca Falls, N. Y.

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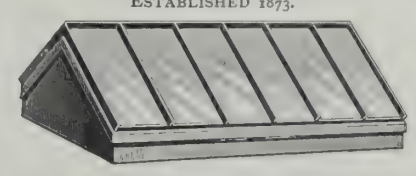

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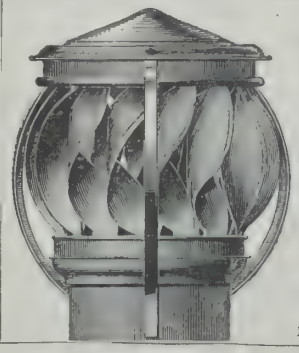

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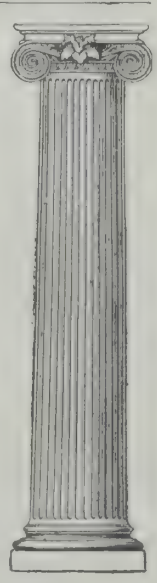

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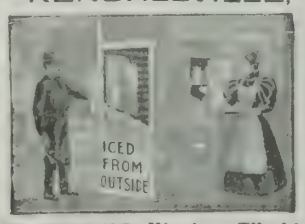

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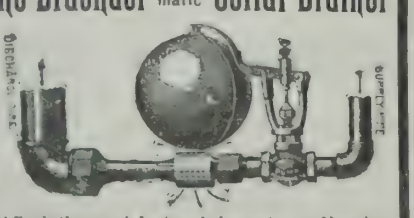

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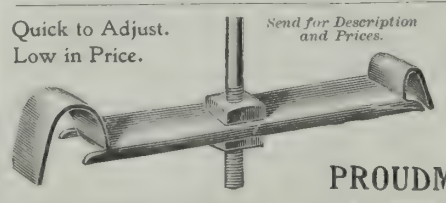

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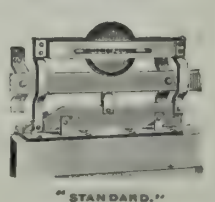

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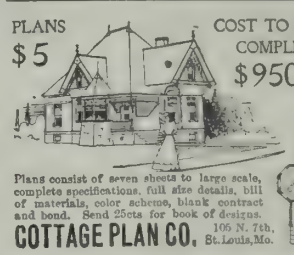

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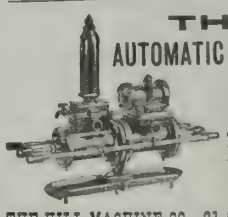

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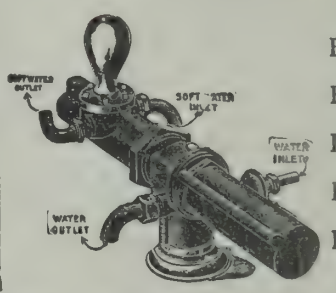

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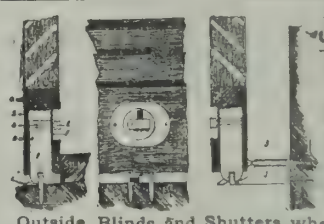

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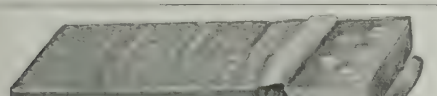

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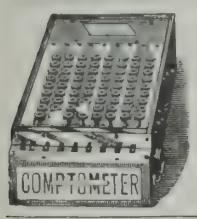

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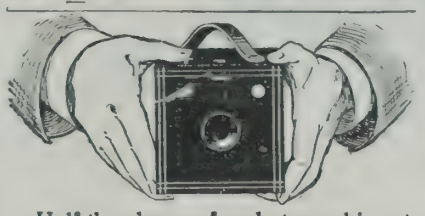

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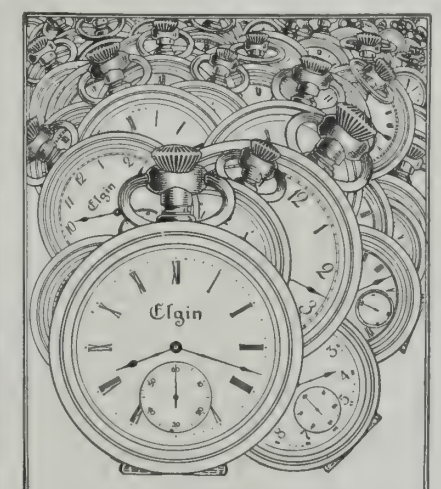

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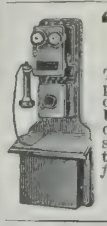

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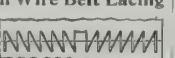

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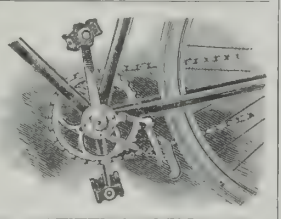

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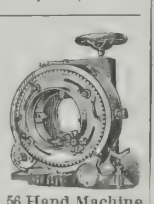

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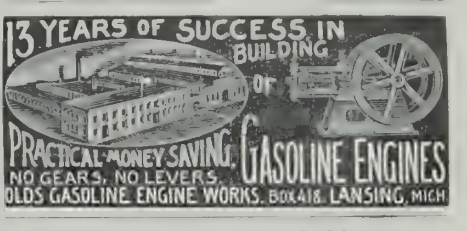

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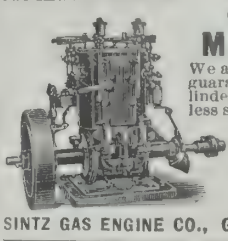

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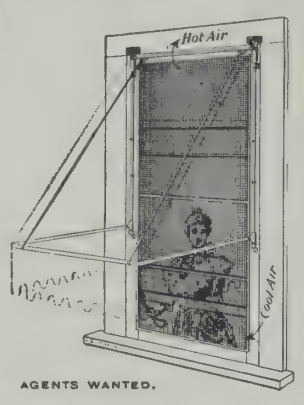

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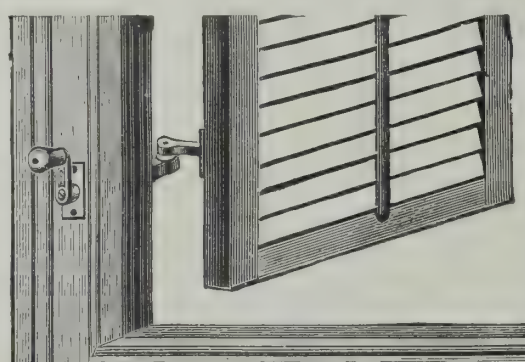

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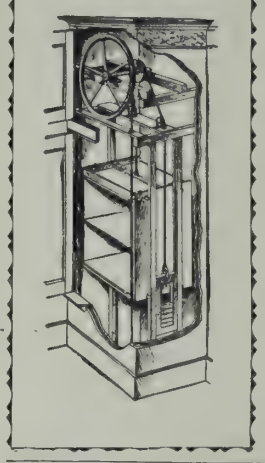

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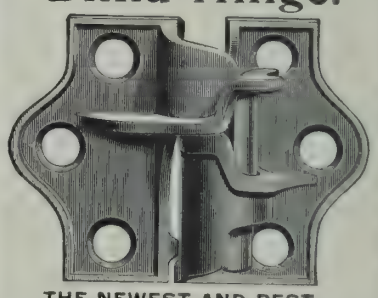

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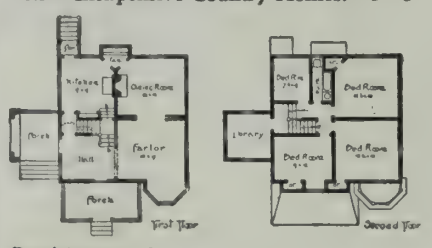

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THE COURTYARD OF THE MATTEI PALACE, ROME.—See page 41.

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THE EXHIBITION OF THE ARCHITECTURAL LEAGUE.

The exhibitions of the Architectural League are always of the greatest interest to the layman as well as to the professional architect, and the Fourteenth Annual Exhibition, which was opened to the public, in New York, on February 11, was not an exception to this rule. The Architectural League is more in touch with our contemporary life than any of the annual exhibitions, representing, as it does, an epitome of the modern American effort in architecture and the allied arts. In an exhibition like the present we have the latest expression of the prevailing tendencies; no aspect of the subject is omitted. The great office building, perhaps the most remarkable expression of our architectural effort, is usually to be found here in all its glory, and it will be seen that while commercial necessities produce these huge structures, the architect is constantly striving to invest them with beauty, and in many cases their efforts are crowned with considerable success. The skeleton steel construction demands an entirely new treatment, both in design and ornamentation of the façade, from that which existed twenty years ago, so the fact is, that at present American requirements are evolving a wholly new thing in architecture, perhaps the most important addition to the art for nearly two centuries. Such an evolution is of the greatest interest, and it can nowhere be studied as well as at the Architectural League. Still, strange to say, the present exhibition is weak in examples of these costly and important structures. The work of the sculptor, the mural painter, the designer of stained glass, the bronze caster, the artsmith, and even the designer of book covers and posters, is not omitted, and to the average visitor the exhibit of the craftsmen in arts allied to architecture is the most attractive of all. In this leavening of utility with beauty, the Architectural League is playing a great part in the development of artistic appreciation in America, for what the public most needs at the present time is education by lessons which show that it costs little, if any more, to make houses and other structures beautiful than to have them bizarre with grotesque ornamentation which debases the public taste. The more the public recognizes the intimate connection between the work of the League and their own artistic environments, the greater will be the measure of support that they will accord it. If the hands of professional workers are upheld by the layman, it will be a long step forward in producing what America so sadly lacks—artistic cities and towns.

In the present exhibition there is a want of a central feature, such as was furnished by the drawings of the Public Library last year, but on the whole the exhibits are of great excellence, and this is decidedly an architect's exhibition. The iron and bronze work, tiles, book covers, posters, magazine covers, book plates, etc., are particularly interesting this year, and the burnt wood is most remarkable. The latter is an ideal form of decoration for handsome houses, and the effect which is obtained by cutting away the background, and leaving the principal figures in very high relief, is most remarkable. Among the working drawings and color sketches exhibited in the first gallery are sketches from the crayon and brush of John LaFarge, Francis Lathrop, Kenyon Cox, F. A. Bridgman, Mr. and Mrs. Sewell, F. S. Lamb, and many others. A specially notable exhibit is some of the studies for the ceiling of Mrs. Drexel's house in Philadelphia by Mr. Edwin H. Blashfield.

In the large Vanderbilt gallery are arranged the architectural exhibits, and one end is almost entirely covered by a splendid example of a front of a house in polychrome terra-cotta. It is surprising that this beautiful material, which was used so much for a building and decorating material during the Renaissance, is not more popular. The refined and delicate tints which can be obtained with the burnt clay render it an ideal building material. A large restaurant in the new Dun Building in New York is a charming example of its use.

A large majority of the architectural exhibits are of residences in town and country, and a number of them possess remarkable features of interest to the architect and their employers as well. Undoubtedly the most remarkable is what is termed a "Preliminary Study for a Bayberry Point House," for H. O. Havemeyer, by Grosvenor Atterbury. The collection of low buildings, with their flat roofs, such as are found in Capri and other places in southern Italy, was most effective. Loggias are thrown out at different points, and there is a profusion of arbors in the Italian style. We cannot conceive of any form of residence more adapted for summer use, and a *villeggiatura* in a house of this kind would be most delightful. There is an excellent model of this house on exhibition. The house of Henry R. Kunhardt, in Bernardsville, N. J., of which Henry Rutgers Marshall is the architect, is also remarkable: it is built of stucco, with red-tiled roofs and chimneys which suggest bell turrets. The house is a two-story structure, and the arcades on the ground floor suggest cloisters. These two houses are excellent examples of what can be done with a moderate expenditure to produce artistic country houses which will afford the maximum amount of comfort. Another model which is interesting is that of the Clark house, an imposing pile which will be built on a narrow lot at the corner of Fifth Avenue and Seventy-seventh Street. The façades will be undoubtedly the most ornate ever produced in America, but the results will not prove more pleasing than the two comparatively inexpensive houses we have noted. The work of the landscape gardener is not very much in evidence, though Daniel W. Langton presents two attractive examples, both in Princeton, N. J.: "Peep o' Day," the residence of Mr. Laurence Hutton, and the place of Mr. Pyne. Mr. Post's design for the new buildings for the College of the City of New York is an important one. The arrangement is new; the building is fan-shaped, the two inner sticks of the fan being cloisters. In many ways this is an ideal form of a scholastic building, and the elevation shows an interesting example of Tudor architecture. The law school of the University of Pennsylvania is another excellent example of a modified colonial school building. Messrs. Cope & Stewardson, the architects of Blair Hall, Princeton, N. J., present the design. The largest drawing in the room is that of Richard H. and the late Richard Morris Hunt; it is the façade for the new eastern wing of the Metropolitan Museum of Art, and is a most dignified design.

The two most notable designs for high buildings are the G. Kramer Thompson's design of a hotel and Bruce Price's "Archipolis," a building of twenty stories or over, in which the masses are admirably managed, the angles being emphazied by projecting towers or turrets of considerable width, and each being capped by low pavilions. This design may be regarded as one of the most successful attempts at the solution of the high building problem which has been offered. We would like to see the design executed. The new immigrant station at Ellis Island, by Messrs. Boring & Tilton, is represented by a large model.

In addition to buildings there are some excellent designs for monuments, of which Bruce Price's "Study for a Monument" occupies the first place. This is a monumental masking of the intersection of two streets. At present, in New York, we are apt to use a space of this kind for advertising purposes, with electric signs, and it is to be hoped that some time we may have at least a dignified monument at such a place.

The flagstaffs which were sent in for the Municipal Art competition are also on exhibition. Some of them are pleasing; others are hideous. It is to be hoped that this society will go on, have competitions for smaller things, such as lamp posts, street signs, etc., which have more of a chance of being executed than a large or florid flagstaff holder. It is certainly not needed at the City Hall.

In closing, it is only fair to make mention of the catalogue, which really forms a beautiful book, giving some of the best examples of contemporary architecture and decoration. The exhibition is as popular as ever, and under the liberal management many thousands of people are enabled to view the remarkable exhibition without expense. This is an education of the public for which all who are interested in art in America should be grateful.

MOSAICS.

The art of producing artistic designs by setting small pieces of stone, glass, burnt clay, or other materials of different colors so as to produce the effect of a painting, or a decorative effect by means of conventional patterns, is a very old one, and its origin is lost in antiquity. We know that it was much practiced by the ancient Greeks, Carthaginians, and Romans, specially for ornamental pavements. Later, under the Byzantine Empire, it was much used for the ornamentation of churches, in which it formed a large portion of the wall decorations. It was reintroduced into Italy for the same purpose about the middle of the thirteenth century. Since then it has been brought to such wonderful perfection that large pictures can be minutely imitated by it, although it may be questioned if this is the most artistic use to which mosaic may be put. Mosaics have been used since the time of the ancients whenever decorations were needed that would resist wear, destruction by the elements, and the decay of time. Because of its enduring quality it has been the medium of color decoration in monuments and monumental buildings, even where destructive influences were practically excluded, for the idea of endurance which underlies monumental structures must extend also to their decoration. From the number of such works which remain to us from all periods of history of this art under the various conditions of wear and exposure under widely different climatic influences, we are enabled to point to the material which, out of the many used for mosaic work, has withstood destructive influences the best. The material which has most signally resisted abrasion and disintegration is hard burnt clay. The remains of the pavement of the atria and aulæ of the Roman houses in England and Germany have shown that mosaics of burnt clay tesseræ were neither worn away by the treading of the feet nor disintegrated by the action of frost, as were all those made from natural stones. The celebrated tile friezes of the Assyrians at Babylon and at Susa, the wall tiles from the burial vaults of the Etruscans, are monuments to the permanent beauty and indestructibility of ceramic decorations, and, like the pottery vases of the Greeks, were unaffected by time and exposure, amidst the crumbling and decaying marbles and granites of structures in which they were placed. It has been proved that in much frequented places, under the activity of modern intercourse, floors of wood, marble, and cement, or composition pavement, made of broken marble and cement, soon became unsightly, and mosaics of colored marble set in cement, while resisting the wear of the Roman sandals, did not stand the treading of the modern shoes with their metallic heel nails.

Marble mosaic is all right for walls or ceilings, and when used for floors for a time looks more glossy on the surface than ceramic mosaic, and for that reason may be thought preferable, but its appearance is due merely to the polish produced by rubbing down to an even surface when fixed in position, the face being afterwards coated with wax or oil. The wax soon wears off, and the oil collects the dust. In time this rubbing reduces the marble to a very thin shell, and when subjected to the wear of traffic the marble, sooner or later, assumes an uneven surface, and as it wears the joints become larger, as marble mosaic is cut with a hammer, the top being larger than the bottom.

Mr. H. A. Hopkins, of Washington, D. C., to whom we are indebted for these interesting and valuable notes on mosaic, states that ceramic mosaic is fixed at once with an even surface, and cannot afterwards be ground down by rubbing, the material being too hard to be affected by any grinding which is employed on marble mosaic. It begins to polish the first time it is washed, and looks brighter and cleaner after every subsequent washing, gradually acquiring the face which is so pleasing when marble mosaic is new. This polish will not wear off as long as it is regularly washed once a week. Ceramic mosaic is incomparably harder than marble mosaic, which can easily be proved by rubbing a piece of each of the two kinds together; the soft marble will grind away. All of the varieties of color in marble are produced in ceramic mosaic, and besides hundreds of shades not found in the natural stone. Because of a peculiar quality of burnt clay which may be described as toughness, ceramic mosaic possesses a species of superiority over glass mosaic, owing to the brittleness of the glass. The pieces used in floors very quickly become chipped around the edges, thus widening the joints in an objectionable manner, a greater portion of the cement becoming visible, thus marring the design. The substance of which glass mosaic is formed is not solid, but contains small, flat, and spherical air holes, each increasing in size by chipping, just as do the edges of the pieces, thus affecting the colors. Glass mosaics make very beautiful pictures for wall decorations, but they do not last on floors. From what has been said it will be seen that ceramic mosaic has points of superiority over all other forms of mosaic for use on floors.

THE HEATING AND VENTILATING OF SCHOOL BUILDINGS.

The Indiana State Board of Health, in a recent report, made some interesting recommendations on the heating and ventilating of school buildings which were eminently common sense. The report states that heating by ordinary stoves is objectionable. One-roomed schoolhouses should be warmed by ventilating heaters which take their air from outside of the building and distribute it evenly through the room after warming it. Schoolrooms should never be heated by steam or hot water radiators. Hot air furnaces should take their air supply from outside the house and introduce it into the room above the breathing line, that is to say some six or seven feet

from the floor. If heated by steam or hot water the coils should be without the rooms and the air passing over them should be taken from the outside. Heating by warm air furnaces is indirect under all circumstances. It may be divided into three classes: first, heating by furnaces without ventilation; this is a system which has much to condemn it; second, furnace heating, ventilation by the gravity system, which is allowable but not the best; and third, furnace heating or ventilation by the mechanical system and fans to control the circulation of the air.

It has been proved many times, by exhaustive experiments, that schoolrooms cannot be properly ventilated by windows and doors without creating drafts, which are, of course, dangerous, but possibly no more so than bad air. Every schoolroom should have ventilating flues. In large schoolhouses it is best to have mechanical ventilation; that is, removing the vitiated air entirely by fans, and introduce warm air by fans above the breathing line. In one-roomed schoolhouses which are heated by ordinary stoves ventilating means should be substituted. When these reforms cannot be accomplished the Health office would recommend that a solid board six inches wide, and as long as the window sash is wide, be placed beneath each window sash. This will raise the lower sash six inches and stop up the opening. This is only a makeshift, but it is of some value. Another and far better method of ventilating one-room schoolhouses is to provide in the centre of the room a galvanized iron pipe five feet in diameter, reaching six inches above the floor through the roof into the outer air, and having a hood on the top. Into this, about seven feet from the floor, conduct the stovepipe, running the same from the point of entrance through the centre of the large pipe to its very top. The hot stovepipe warms the air surrounding it within the large pipe, and thus creates a current upward.

THE MATTEI PALACE, ROME.

ROME was famous during the Renaissance for her splendid palaces, and fortunately a greater part of the important ones have come down to us, in many cases, almost intact. The palaces for the great families and princes of the church called for the exercise of the talents of the greatest architects. On page 39 is shown a view of the courtyard of the Mattei Palace, at Rome, which is the example of an interesting though rather late palace. It was built in 1615 by Carlo Maderna for the Duke Asdrubale Mattei, and it is built on the site of the Circus Flaminius, which was the second of the great *circi* of ancient Rome. The long open space was used for a time as a ropewalk, and later the huge palace was erected upon it. The Palazzo Mattei has two façades of nearly equal length, being 120 feet long, and one of these façades is extended by accessory buildings. From each of these a corridor leads to the central court, which measures 40 x 50 feet. One end is bounded by a three-arched loggia, which is repeated on the second story. The third story has blind arches. The arches in each of the stories are included within an order of pilasters. At the opposite end of the court, which is shown in our engraving, this architectural treatment is repeated, but the story is a single one. The two side arches are blind, and are pierced with doorways. In the lunette may be seen busts in a circular niche and decorative carvings. Through the central arch access is had to a second court, which is larger and plainer than the first. The small courtyard is one of the handsomest in Rome, the walls being incrusted with ancient bas-reliefs, busts, and other sculptures, and even the pilasters at the side of the open arch have statues on pedestals placed against them. It will readily be seen that the side walls have little relation to the handsome architectural treatment of the screen at the end, for the walls are hung, like a museum, with a multitude of interesting antiques which are scattered between the many windows. The vestibule, loggia, and staircase are utilized in like manner. The principal rooms are painted in fresco, and the staircase landings are covered with low domes with stucco decorations. These are not always in good taste, as the building must necessarily partake of much of the taste of the epoch.

The posts and rings at the corner of the street near the Mattei Palace are curious relics of the time when this powerful Roman family had the right of drawing chains across the streets of the city during the papal conclave, and also of occupying the bridges of San Sisto and Quattro Capi, together with the intervening region of the Ghetto.

PROSPECT CASINO, HARTFORD, CONN.

The engravings shown on page 49 illustrate the Prospect Casino, which has been erected at Hartford, Conn. The design is admirable for a building of this character, and the elevations are attractive and artistically finished, with a graceful sloping roof sweeping down and forming a cover for the spacious piazza. The underpining is built of rock-faced bluestone. The exterior above is of wood and is covered with sheathing, and then shingles, left to weather finish a natural silvery gray color. The roof is also shingled. Dimensions: Front, 62 ft.; side, 96 ft., not including piazza. Height of ceilings: Cellar, 9 ft.; first story front, 11 ft.; second, 9 ft. The interior arrangement is most excellent. Upon entering the vestibule you find a hall beyond, both of which are trimmed with white pine, and treated in ivory white. This hall contains a grand staircase, with sweeping steps and ornamental turned newels, posts, balusters, and rail, treated same as trim. Floor of yellow pine. Beyond this entrance hall is the main assembly room, trimmed with white pine, and treated in colors. This hall is well lighted and ventilated, and it is fitted up with a large stage, with dressing-rooms on either side. The reading-room, of large dimensions, is trimmed also with white pine, and treated with white enamel. It contains a large open fireplace, furnished with a tiled hearth and facings, wrought-iron trimmings, and a massive wood mantel. The ladies' parlor and reception-room are treated in a similar manner, and are conveniently located. The basement, or cellar, contains the bowling alleys, billiard-room, kitchen, and furnace-room. The billiard-room is wainscoted with North Carolina pine. The third floor contains a balcony looking into assembly room, and two other apartments. Cost, $10,000, complete. Mr. Willis E. Becker, architect, No. 756 Main Street, Hartford, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

NEW STATUE OF WASHINGTON AT NEWARK, N. J.

NEW STATUE OF WASHINGTON AT NEWARK, N. J.

The Washington Monument Association, of Newark, N. J., is composed of the senior and junior orders of United American Mechanics, Daughters of Liberty, and Daughters of America. These bodies united over a year ago to erect a monument to George Washington which will be placed in Washington Park, Newark, N. J. The commission was given to Mr. Fernando Miranda, of New York, the sketch above being approved by Messrs. Wood, Marquand, and Upjohn. The completed monument will cost about $20,000, and the sum has been largely raised by subscription, and it is expected that it will be completed within the current year.

The pedestal will rest on thirteen steps, symbolical of the thirteen original States of the Union. The base is 36 feet wide and 42 feet long, the pedestal is 17 feet high; both base and pedestal will be of granite. The bronze equestrian statue, 11 feet high, rests on the top of the pedestal, while on the front of the latter is a female figure typifying "Patriotism" in the act of offering the palm of glory to the name of Washington. There are also reliefs on each side of the pedestal illustrating events in the life of Washington. The reliefs are 5 feet long and 2 feet 6 inches high.

A MODERN DWELLING AT FOREST HILL, NEWARK, N. J.

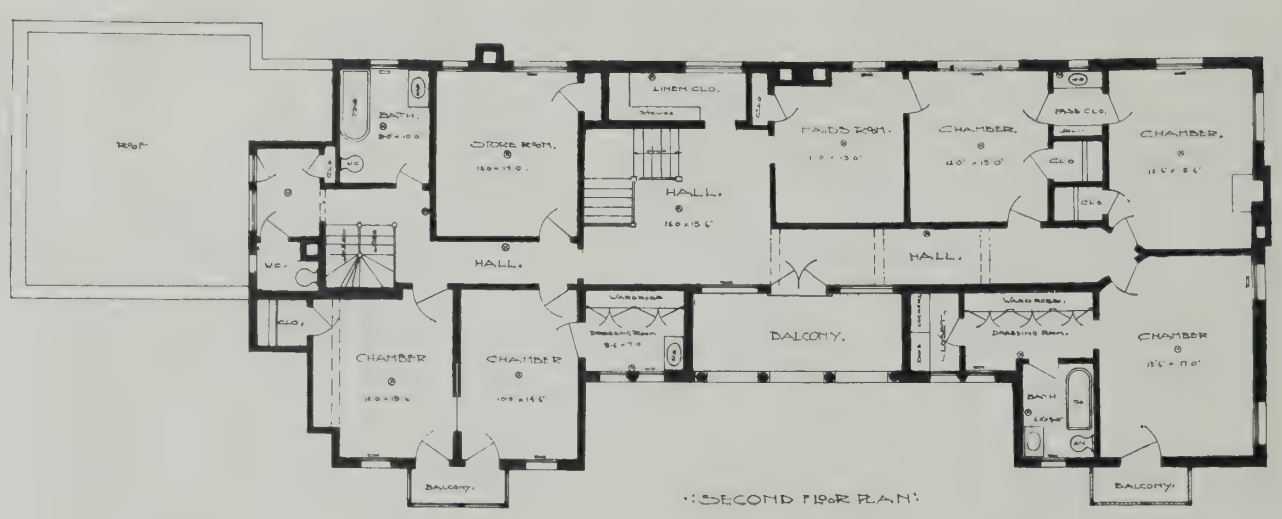
The illustration shown on page 47, in this issue, presents a modern dwelling, which has been erected for Mr. James Abercrombie, at Forest Hill, Newark, N. J. The design is executed in an excellent manner, and t combines both pleasing elevations and well-arranged plans. The underpinning is constructed of rock-faced brownstone. The first story is built of old gold brick, with brownstone trimmings. The second story is covered with sheathing, paper, and shingles, and is stained a deep brown color. The roof is shingled and finished natural. Dimensions: Front, 38 ft.; side, 36 ft., not including porches. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft. 6 in.; third, 8 ft. 6 in. The first floor is laid with oak, and the second and third floors with North Carolina pine. The trim of first story is of oak, while the remainder of the trim is of whitewood, all finished natural. The hall contains an ornamental staircase, with newels, posts, and balusters turned out of oak, and an open fireplace built of brick with facings and hearth of tiles, and a mantel of excellent design. The library is provided with a bay window, thrown out at one side, a fireplace trimmed with tiles, and mantel, and a private entrance with porch. The parlor and dining-room, of good dimensions, are separated by double sliding doors, and the latter contains a nook for buffet, with window over same, and a china closet in corner. The butler's pantry is well fitted up with drawers, dressers, cupboards, and bowl. The kitchen is wainscoted, and is furnished with all the best modern fixtures. The second floor contains an open hall, five bedrooms, large closets, and two bathrooms, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains servants' quarters and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $6,780, complete, except heating. Messrs. Ten Eyck & Grant, architects, 148 Washington Avenue, Belleville, N. J.

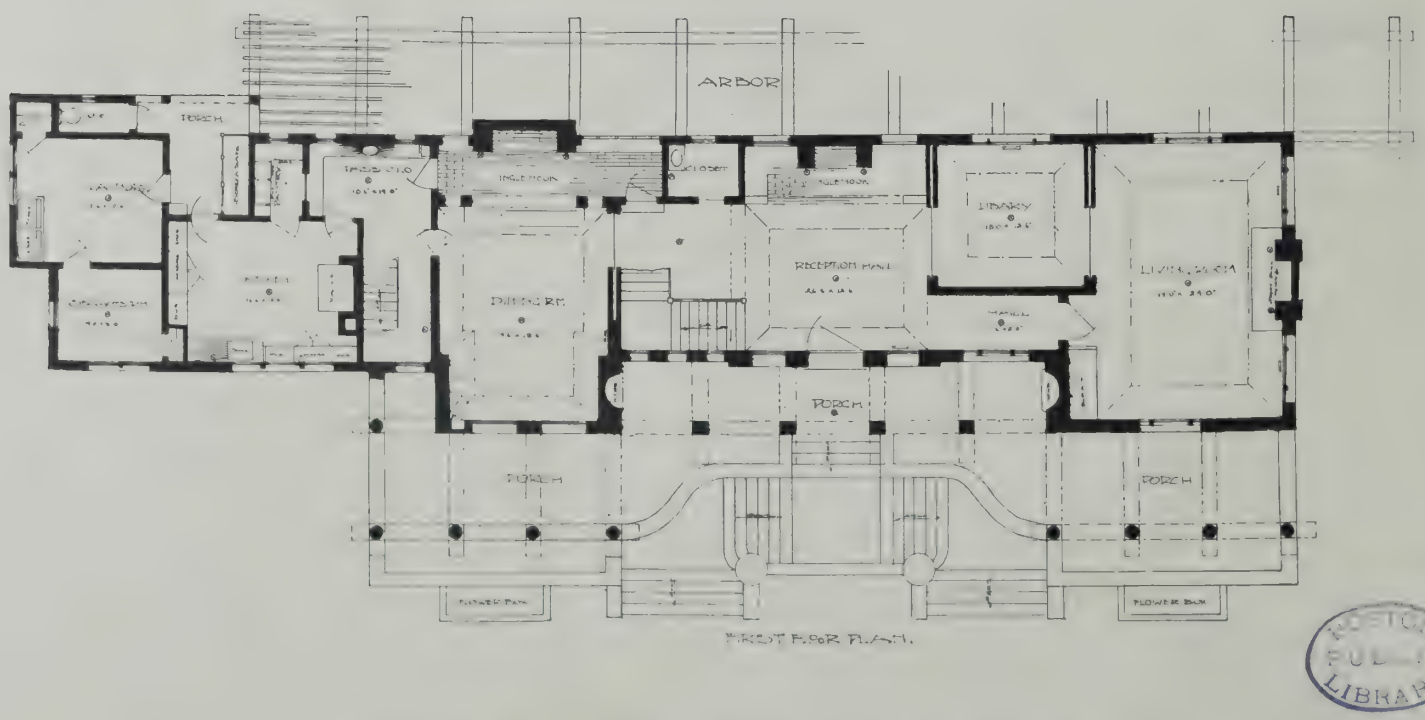
Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN SUBURBAN DWELLING AT LOWERRE, N. Y.

We present, on page 46, a modern suburban dwelling, which has been erected for William Paul, Esq., at Lowerre, N. Y. The design is unique and the plan is excellent. The underpinning is constructed of red brick, laid up in red mortar. The superstructure is built of wood, and the exterior, first story, is covered with clapboards, and painted olive green with bottle-green trimmings; the second story is shingled and stained a dark brown. The roof is also shingled, and is finished natural. Dimensions: Front, 20 ft. 6 in.; side, 42 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior is trimmed with oak on the first floor and ash on the second floor, and both are finished natural. The hall contains an ornamental staircase, with newels, posts, and balusters turned out of oak. This hall is lighted effectively by a stained glass window at side. The parlor contains a bay window, thrown out at side, and an open fireplace with tiled facings and hearth, and a mantel of oak, colonial style, and with a beveled plate glass mirror. The dining-room is a spacious apartment, running across the entire width of house. It has a china closet built in, with glass doors in connection with kitchen, and an open fireplace trimmed with a tiled hearth and facings, and a mantel of oak, with columns rising to ceiling. The kitchen is trimmed and wainscoted with oak, and is furnished with wash trays, sink, and pantries. The second floor contains three bedrooms, and a bathroom wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage. A cemented cellar contains furnace and other necessary apartments.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

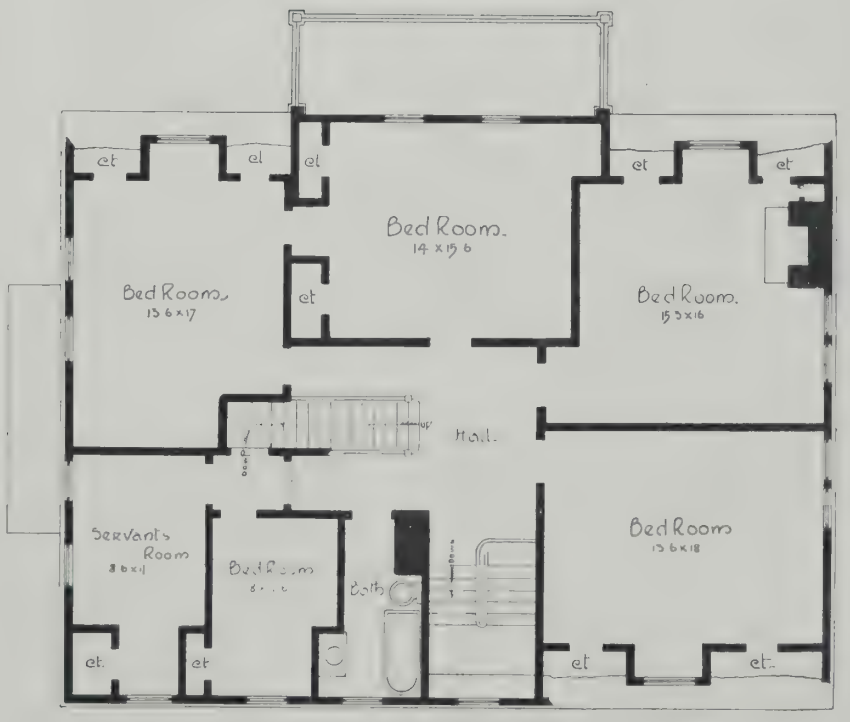




BOSTON PUBLIC LIBRARY

A RESIDENCE AT SAN RAFAEL, CAL.—See page 53.

MESSRS. NEWSOM & MEYER, ARCHITECTS.



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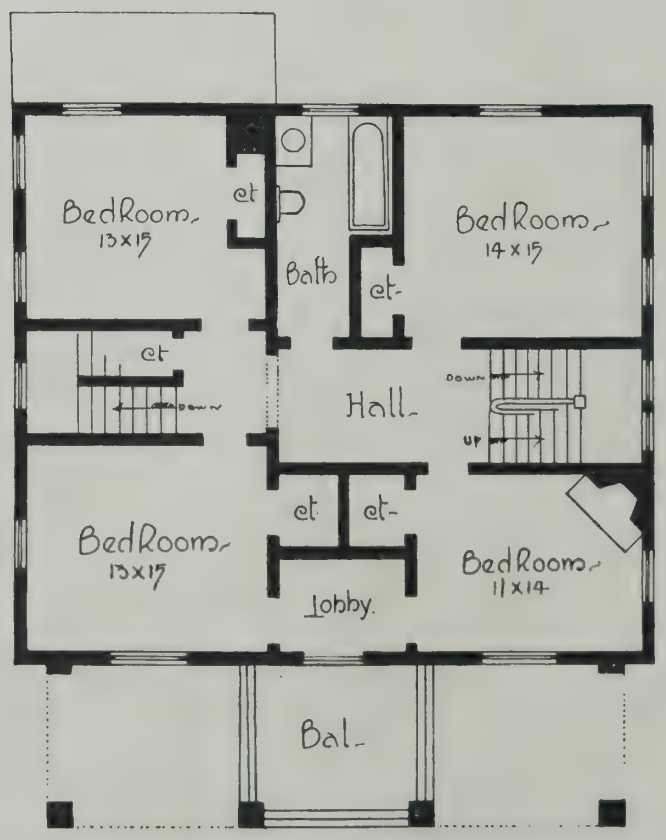
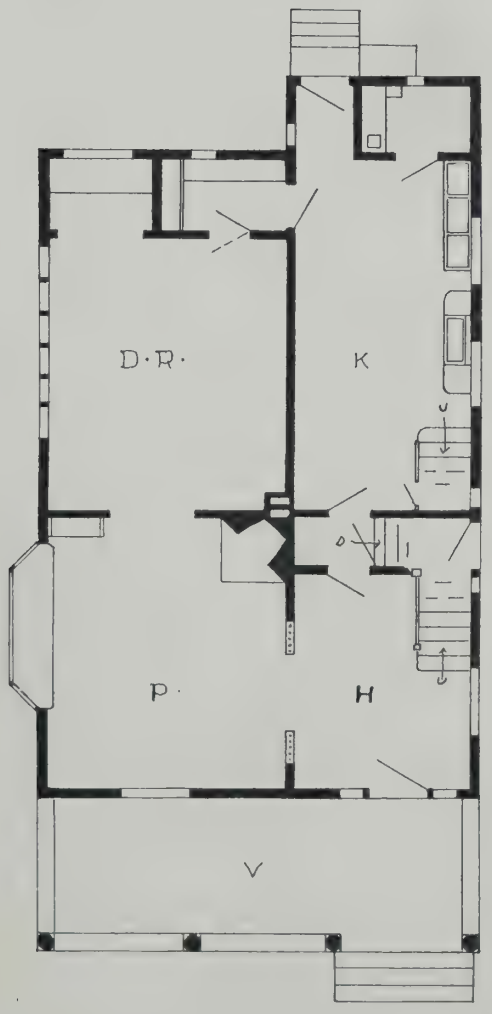
A MODERN RESIDENCE AT NEW HAVEN, CONN.—See page 55.

MR. L. W. ROBINSON, ARCHITECT.

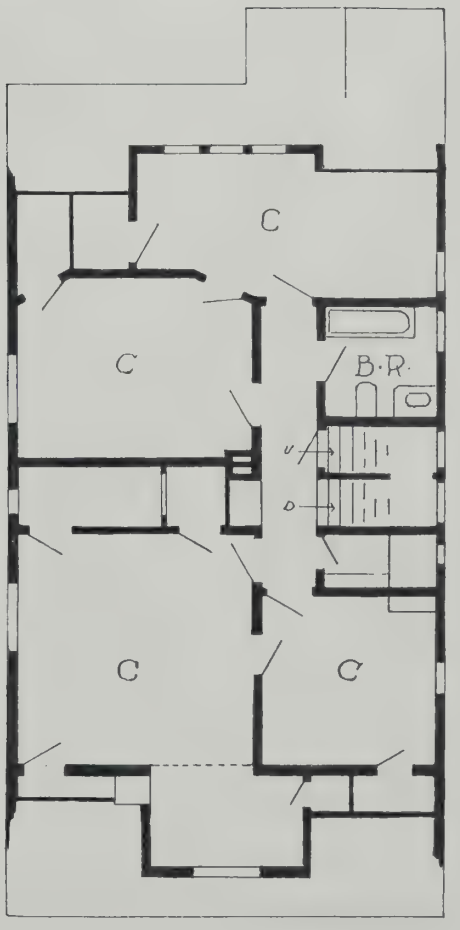


A MODERN COLONIAL HOUSE AT SPRINGFIELD, MASS.—See page 55.

RESIDENCE OF MESSRS. GAYNIER AND AUGEN.



FIRST FLOOR.

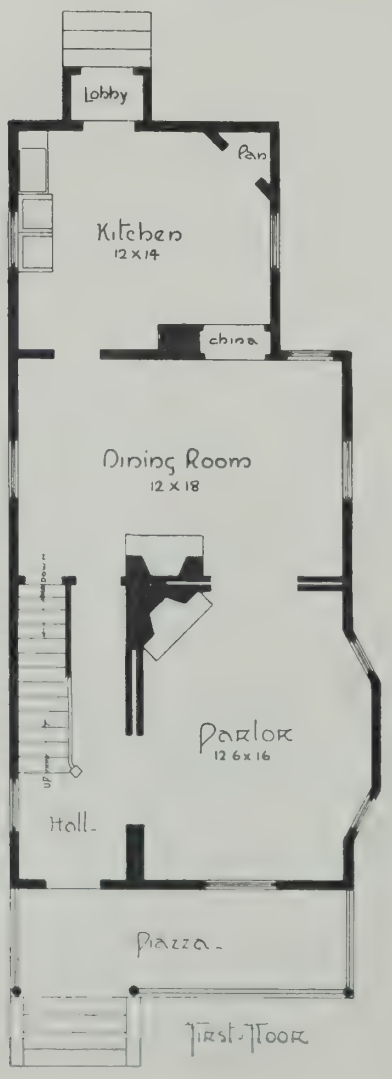


SECOND FLOOR.

BOSTON PUBLIC LIBRARY

A GAMBREL ROOFED HOUSE AT HARTFORD, CONN.—See page 55.

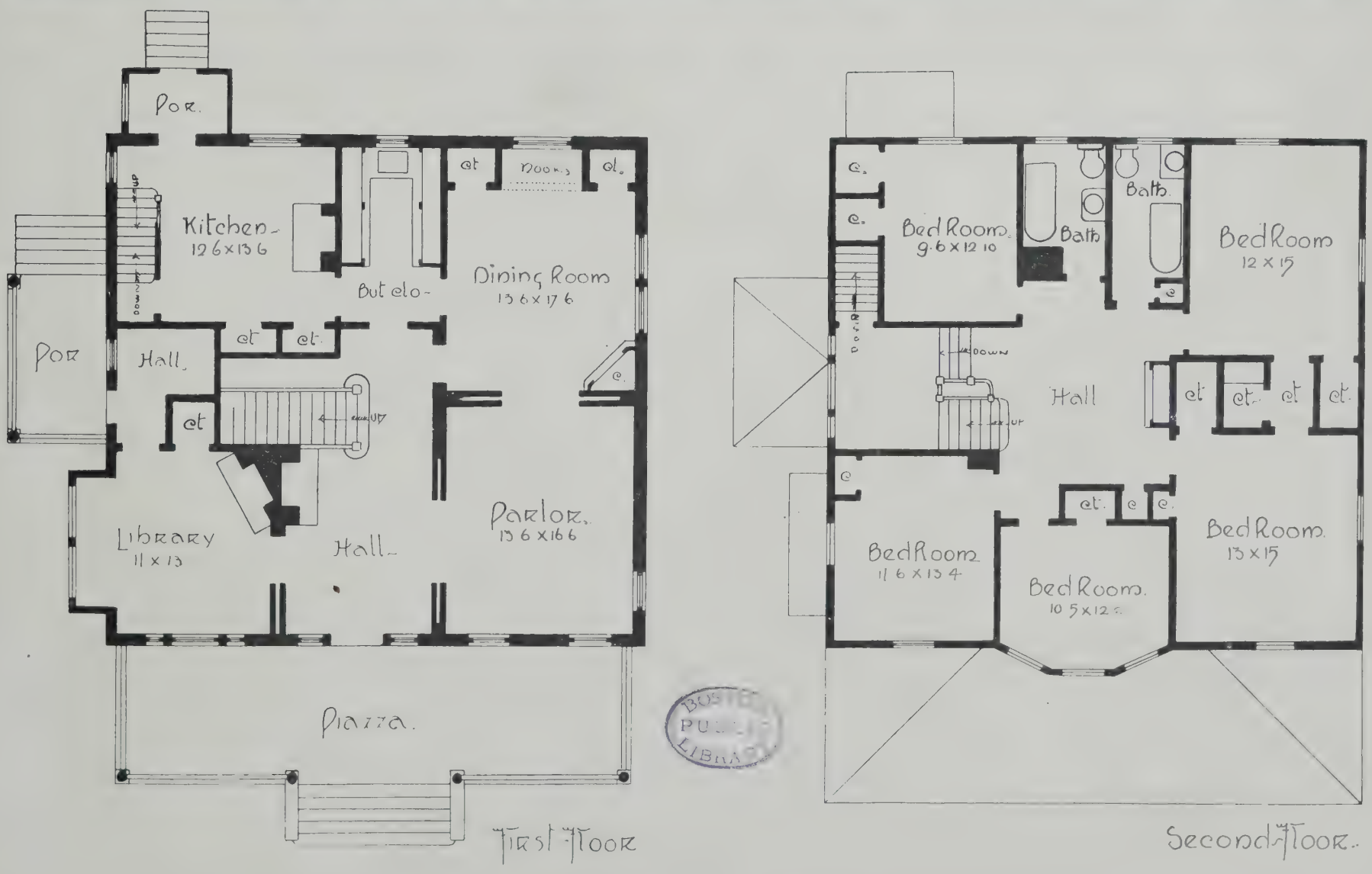
MESSRS. HAPGOOD & HAPGOOD, ARCHITECTS.



BOSTON PUBLIC LIBRARY

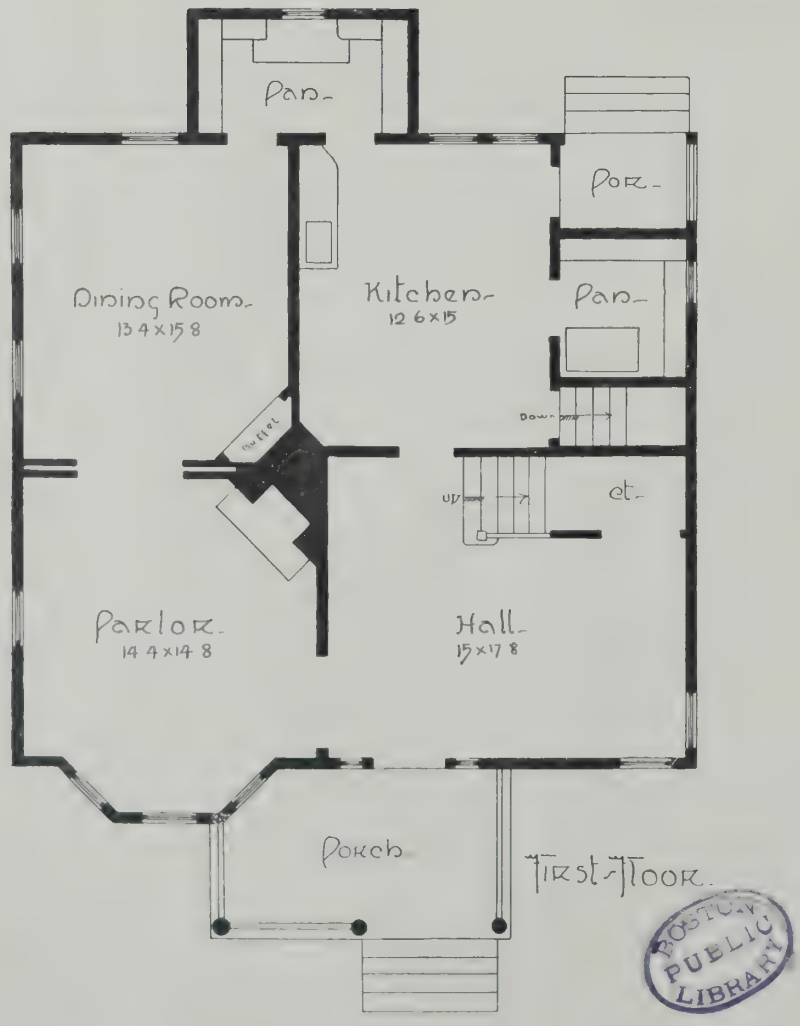
A MODERN SUBURBAN DWELLING AT LOWERRE, N. Y.—See page 41.

RESIDENCE OF WILLIAM PAUL, ESQ.



A MODERN DWELLING AT FOREST HILL, NEWARK, N. J.—See page 41.

MESSRS. TEN EYCK & GRANT, ARCHITECTS.



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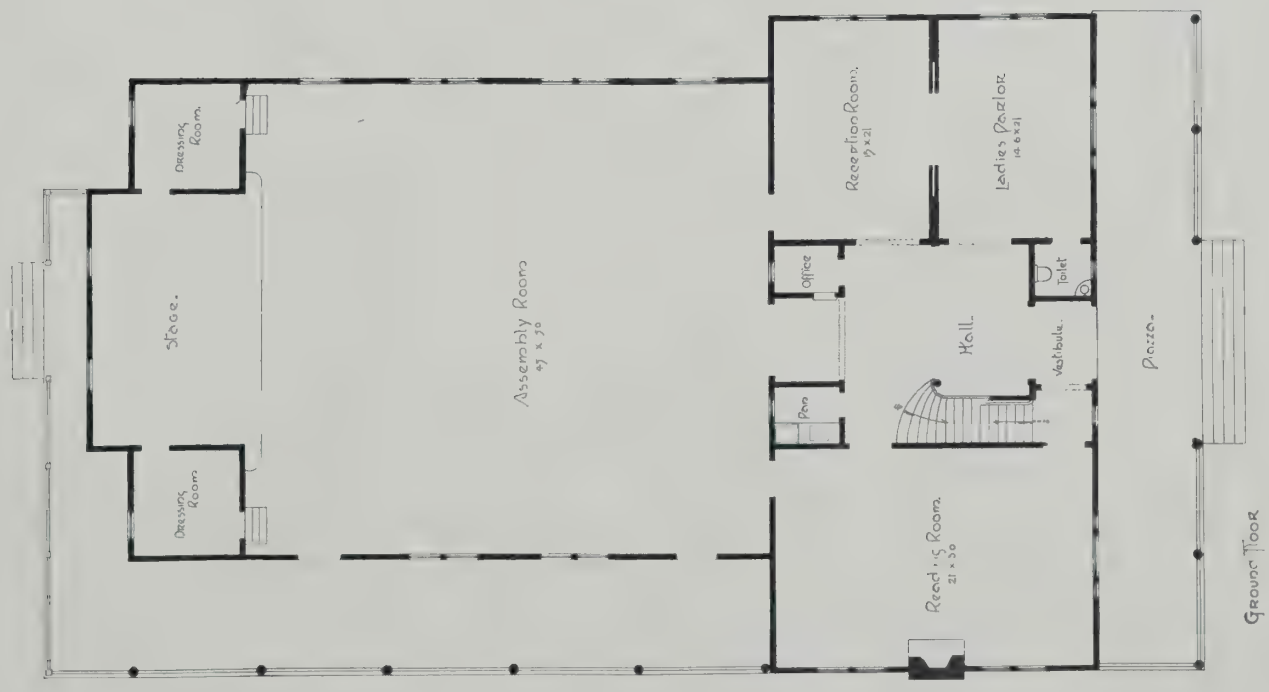
A MODERN DWELLING AT SPRINGFIELD, MASS.—See page 55.

MR. E. J. PARLETT, ARCHITECT.



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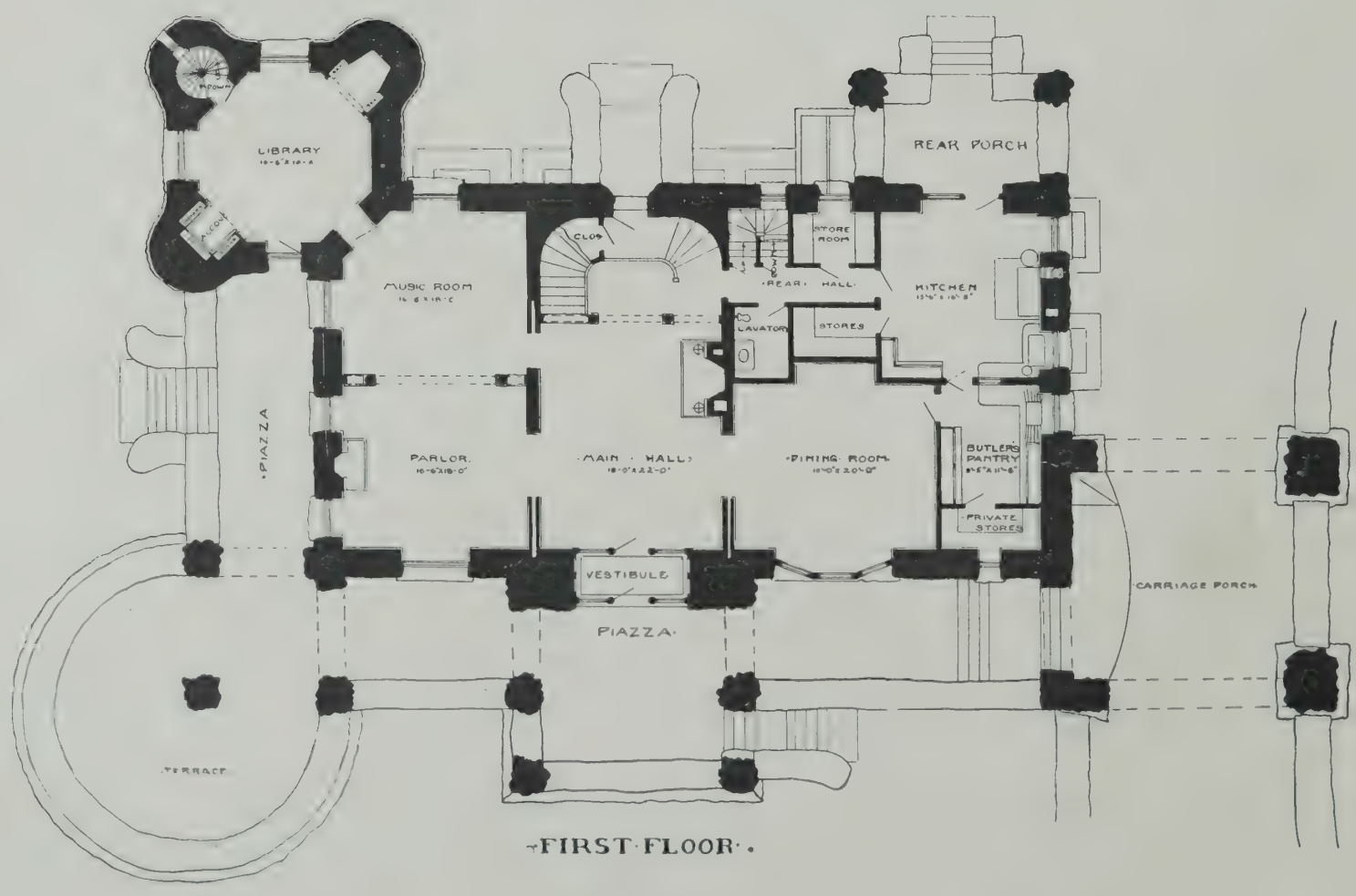
PROSPECT CASINO, HARTFORD, CONN.—See page 41.

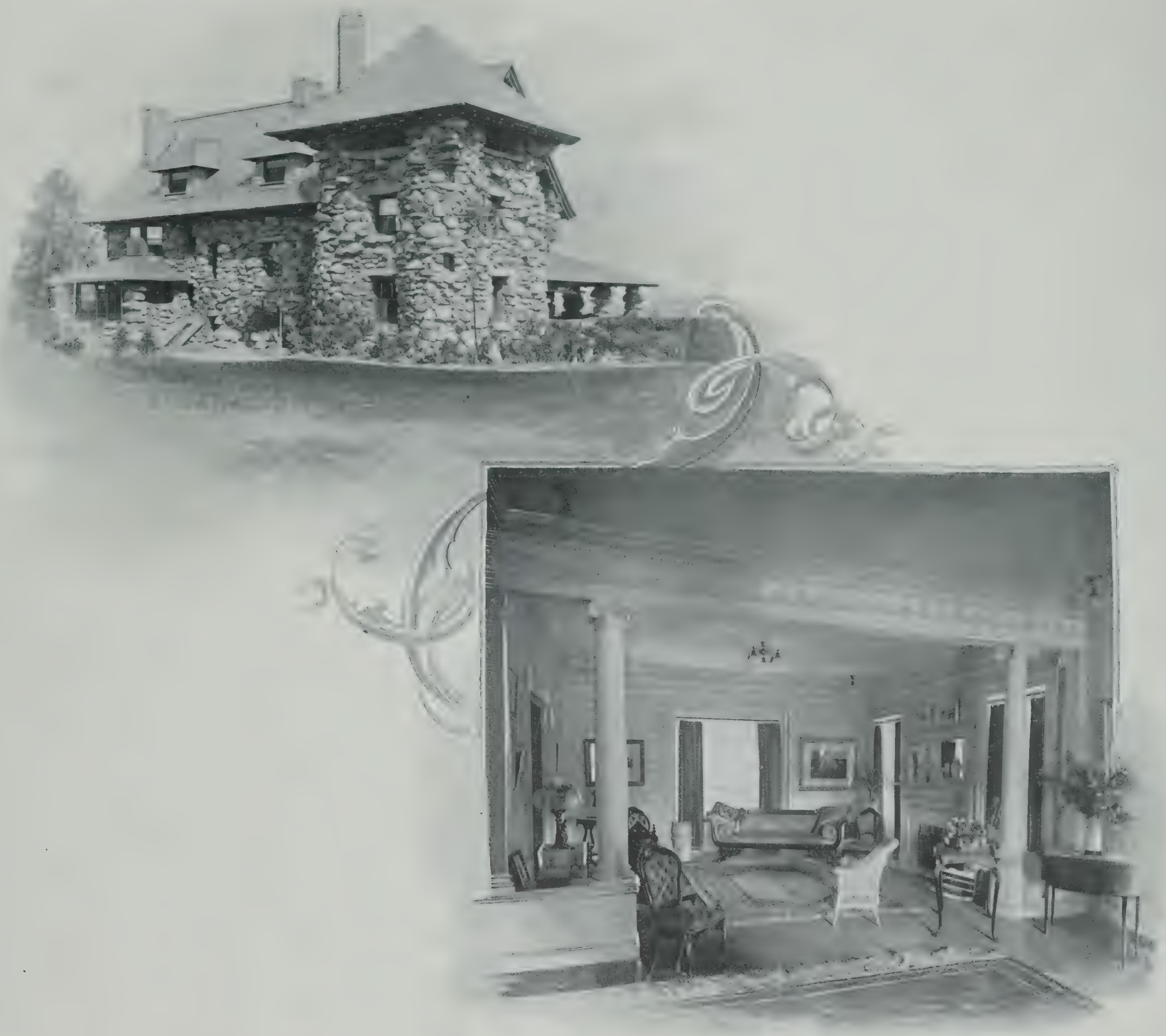
MR. WILLIS E. BECKER, ARCHITECT.

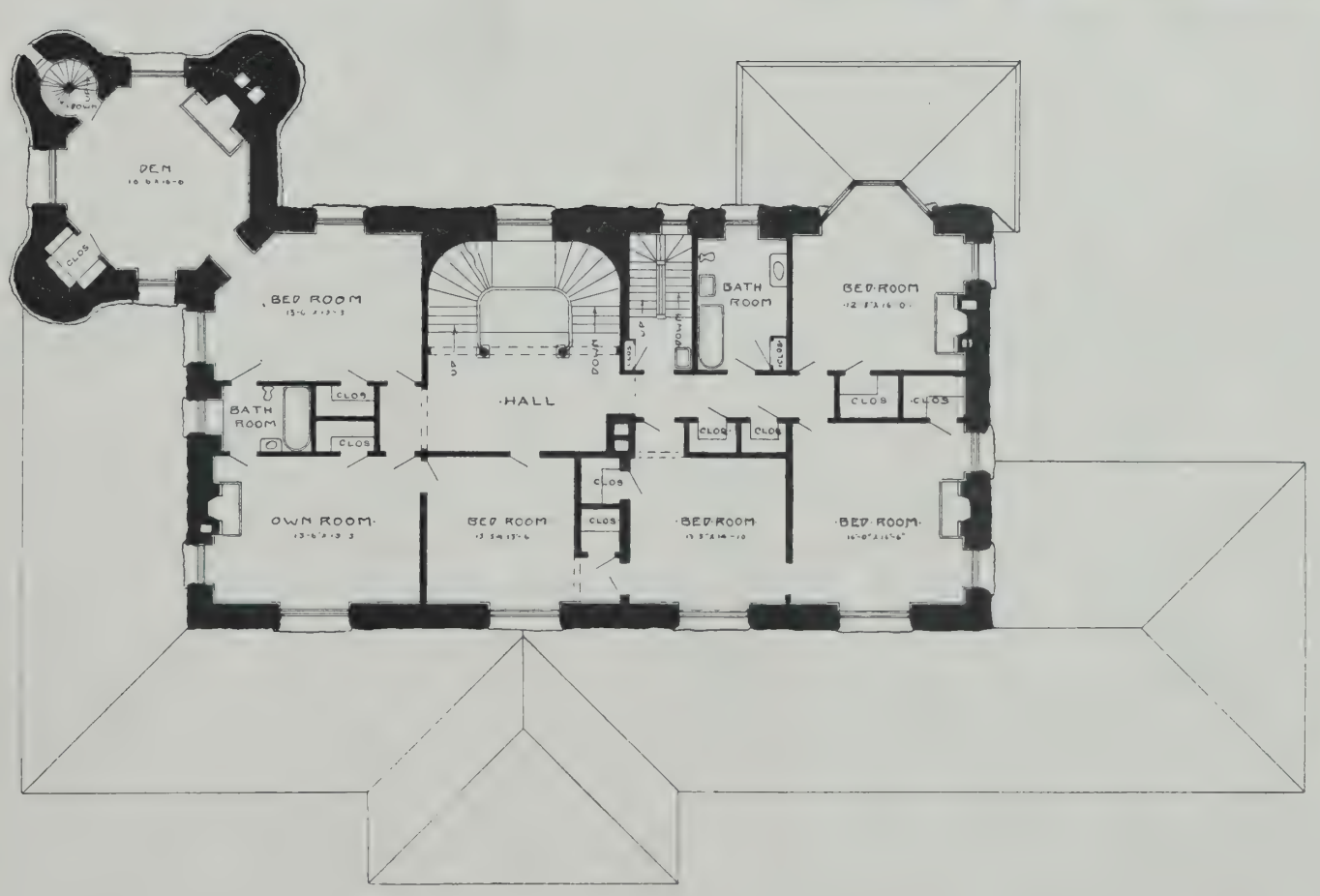


FIRST FLOOR.

A RESIDENCE AT GREENWICH, CONN.—See page 53.

MESSRS. THORP & KNOWLES, ARCHITECTS.

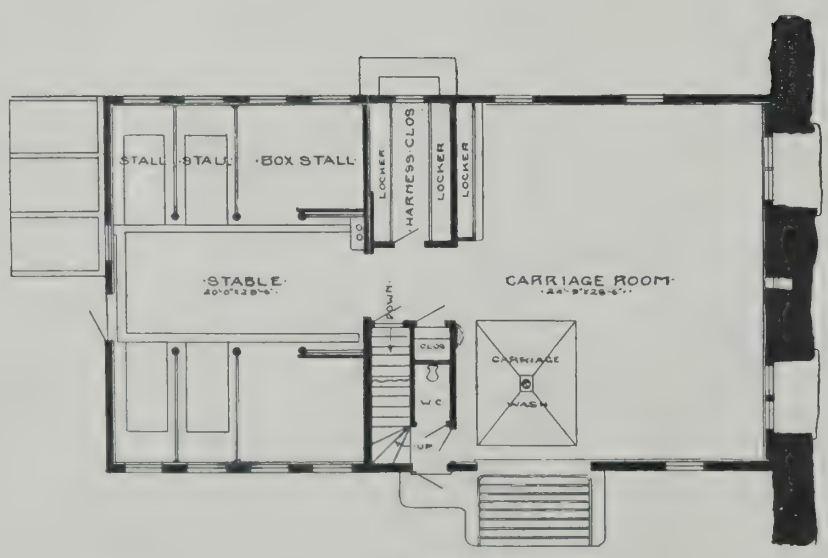




SECOND FLOOR

A RESIDENCE AT GREENWICH, CONN.—See page 53.

MESSRS. THORP & KNOWLES, ARCHITECTS.



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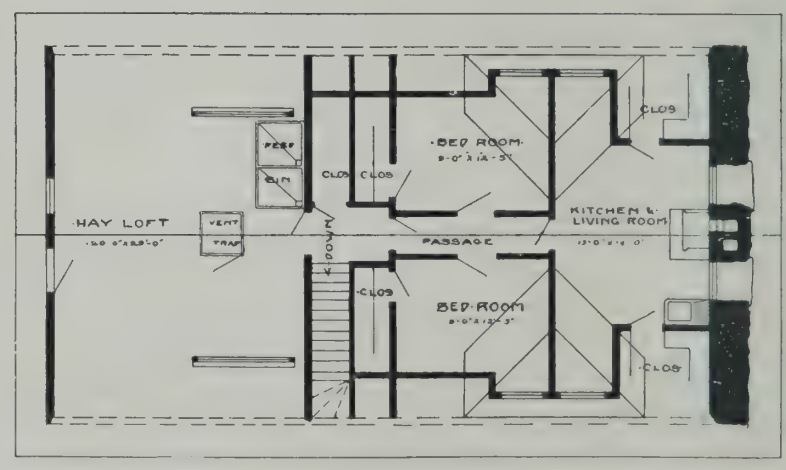


SECOND FLOOR

BOSTON PUBLIC LIBRARY

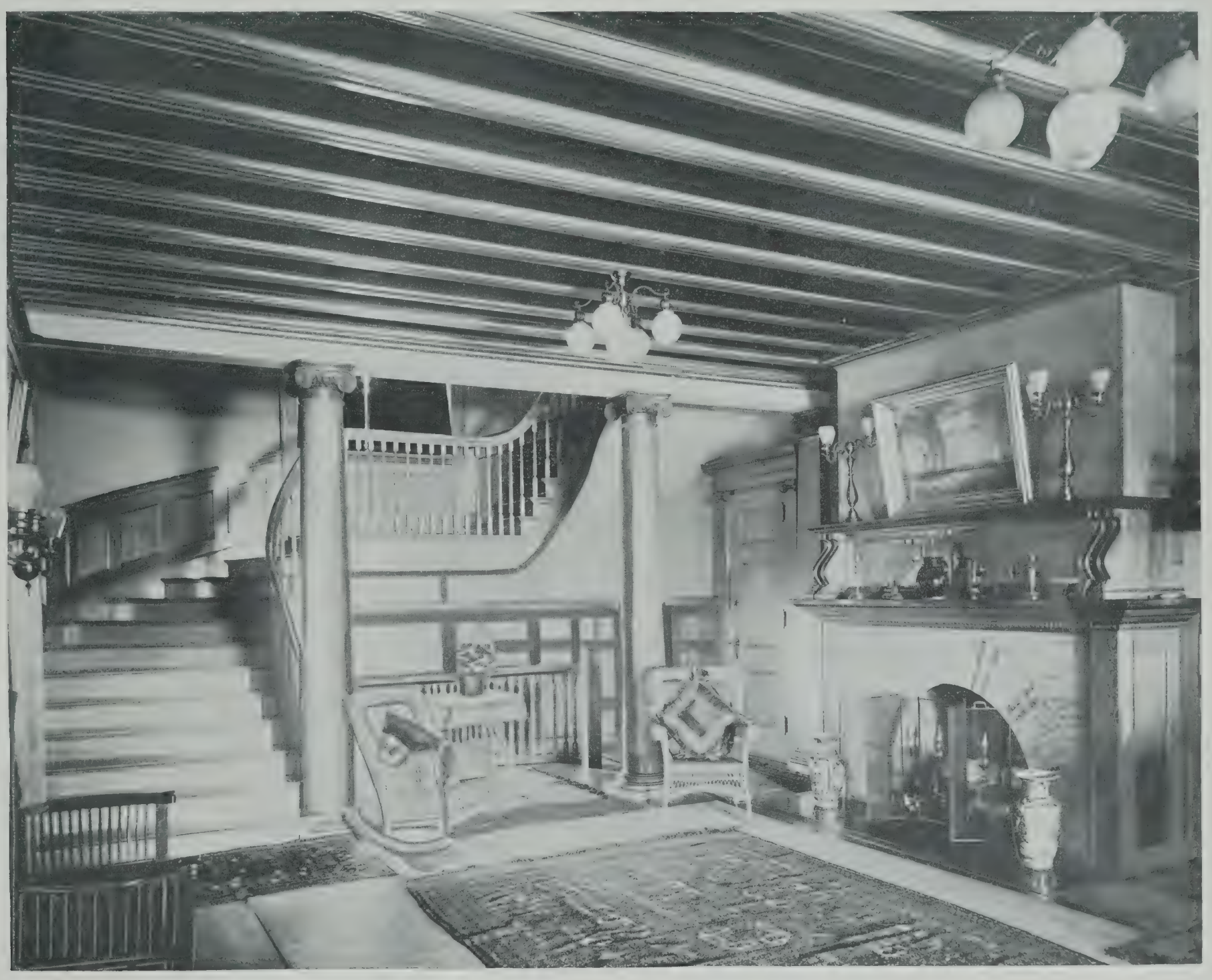
A STABLE AT GREENWICH, CONN.—See page 53.

MESSRS. THORP & KNOWLES, ARCHITECTS.

A RESIDENCE AT GREENWICH, CONN.

We present, pages 50, 51, and below, a residence which has been erected for Nelson B. Mead, Esq., at Greenwich, Conn. The design is most novel, unique, and rustic in character, and it is constructed of walls three feet thick in basement and first story, and reduced to two feet six inches in thickness for the upper stories, of moss-covered dark boulder granite, special care having been exercised in keeping the natural surfaces exposed to view. The stone was taken from the property—from old stone fences and otherwise, of which there was an abundance. The roofs are covered with slate. The piazza floors are of artificial pavement, and the entrance steps of fine axed bluestone. The external appearance is enhanced in beauty each year by the growth of shrubbery and vines over the walls. The appearance, as one enters the piazza from the carriage drive, is of unusual interest. The vista southward through piazza, flanked by walls and piers of great boldness, give at each step a sensation of bewilderment and surprise. The building is over 100 feet in length by 50 feet in depth. The tower, containing the library on first floor, the den on second floor, and the balcony, with its four battlemented piers on the third floor, is accessible by a circular staircase in one corner of the tower. The basement contains a complete heating system, laundry, servants' bathroom, etc. The steam-heating system, with direct and indirect radiation, is specially complete, having two boilers in the cellar, and so installed as to give an even flow of heat and an equable temperature throughout the house in the most severe weather. The main hall is a broad, spacious apartment, and is trimmed with quartered oak. It is furnished with paneled wainscoting and massive ceiling beams. It also contains a massive open fireplace trimmed with a tiled hearth and facings, and a massive oak mantel, and a curved staircase sweeping around four massive columns of classic order, rising to ceiling and forming an arcaded effect, beneath which another short flight of steps descend to rear entrance. The parlor and music-room are treated with ivory white in an artistic manner. The two rooms are separated by column effect, and each has an ornamental cornice in ivory white, touched with gold leaf. The wall decorations are in light, delicate paper with raised ornamentation. These rooms are furnished with old colonial mahogany furniture, with dark rich green rugs. The fireplace in parlor is trimmed with white enamel tiled facings and hearth, and a mantel of colonial style. The library is trimmed with cherry, and it has a deeply recessed fireplace of red brick to match the dark red burlap wall decorations. The alcoves are filled with bookcases. The ceiling and plaster cornice, with Greek ornamentation, is decorated with gold. The dining-room is trimmed with quartered oak, and it has paneled wainscoting and ceiling beams, and a buffet built in and handsomely carved. The dining-room furniture, buffet, and china cabinet are made from special design. The butler's pantry and kitchen and its dependencies are most complete in their arrangement, and each part is fitted up with all the best modern conveniences. The rear hall and lavatory are conveniently located and furnished. The second floor throughout is treated with ivory enamel, which harmonizes nicely with the wall decorations, which are carried out in a plain, delicate tone. This floor contains the den, six bedrooms, with large closets, and private and general bathroom with showers. The bathrooms have tiled wainscotings and paved floor of unglazed tile, and they contain porcelain fixtures and exposed nickelplated plumbing, etc. The third floor contains one guest chamber, billiard-room, storeroom, and three servants' bedrooms. The house is lighted throughout with electricity, and the fixtures, which are placed in many instances on the four corners, instead of, as usual, in the centre, are of old brass, Flemish design. The general contractors were Priess & Co., Orange, N. J.; the steam heating was put in by G. A. Suter & Co., of New York, and the plumbing by D. K. Allen. Messrs. Thorp & Knowles, of New York city, were the architects.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.



HALL IN A RESIDENCE AT GREENWICH, CONN.

A STABLE AT GREENWICH, CONN.

The illustration on page 52, in this issue, presents a stable design in keeping with the residence of Nelson B. Mead, Esq., at Greenwich, Conn., which we present in this issue. The front of the stable is built of rough boulders, same as residence, while the remainder of the building is constructed of wood, with the exterior covered with shingles, and stained a Van Dyke brown. The interior partitions, walls, and ceiling are ceiled up with yellow pine, treated with hard oil. The floors are laid with concrete. The carriage-room, of good dimensions, is provided with carriage wash, lockers, and a harness closet, fitted up replete. The stable contains two box stalls and four single stalls, fitted up with the usual ornamental iron fixtures. The second floor contains ample storage room for hay and feed, and the coachman's apartments, consisting of large kitchen, or living-room, and two bedrooms.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT SAN RAFAEL, CAL.

We illustrate on page 42, in this issue, the residence of Frank S. Johnson, at San Rafael, Marin County, Cal., a suburb of San Francisco, from which it is distant about twenty miles. San Rafael is peopled almost entirely by merchants from the city, who have expended much taste in the erection of many beautiful residences. The village is located right at the foot of Mount Tamalpais, and the range of precipitous mountains incloses it in amphitheatrical form. The heights are covered with shrubbery and forest growths of evergreen, and descend by gentle slopes to the Bay of San Francisco, which forms its eastern boundary. The climate is less temperate than in localities nearer the sea and much warmer, allowing the cultivation of the orange and magnolia and other fruits and flowers of semi-tropical growth, and possesses all the qualifications of a most delightful resting place for merchants fatigued over the labors of the day. The home of Mr. Johnson is an adaptation of the Moorish or Mission style that is coming into greater favor as its possibilities are becoming better known. This style is an evolution of the "adobe," and is probably the most ancient in the world. The house itself is 110 by 35 feet, and in height is two stories and basement. It is located upon a side hill, the mountains in the rear forming an appropriate background. A double covered staircase affords access to the balcony, or porch, which is fifteen

A PORTION OF THE RATHHAUS FAÇADE.

THE NORTHWESTERN SIDE OF THE RATHHAUS.

LÜDER VON BENTHEIM, ARCHITECT.

GENERAL VIEW OF THE RATHHAUS.

REBUILT 1609-1613.

THE RATHHAUS OF BREMEN.—See page 55.

feet square and overhung by the story above. Entrance into the house is through doors into the reception hall, 27 by 18 feet in dimensions, and through which all the rooms on the lower floor are reached. The inside finish is in California redwood. The dining-room has a panel, carved, six feet high on all sides, and is heated from a large fireplace in an adjoining inglenook, built of Spanish floor tile and unglazed brick. Windows are mostly hinged. The great beams are of Oregon pine, 16 by 16 inches, support the second story, and project from the face of the building, following the Spanish custom. The building is constructed of wood, covered with wire lathing and cemented. It is painted light canary color. Four rose windows in crude Spanish ornament the two ends of the building. The roof is of galvanized steel, and parapets are covered with tile. The balcony is latticed and floored with brick. The effort has been made to adapt the particular style in which the building is erected to the requirements of a modern residence. In every possible manner the customs and methods employed by architects of the old missions have been followed, both in the interior arrangements and exterior adornments. The effect is highly picturesque and the result most satisfactory. In cold as well as in hot climates the buildings, with their thick walls, admirably protect from either extreme of climate. The cost was $10,000. The architects are Messrs. Newsom & Meyer, San Francisco.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN DWELLING AT SPRINGFIELD, MASS.

We illustrate, on page 48, a modern dwelling house, which has been erected for Dr. Henry T. Breck, at Springfield, Mass. The design is admirable for a modern dwelling house, and it combines both pleasing elevations and well-arranged plans. The underpinning is laid up with red brick in red mortar. The superstructure is constructed of wood, with the exterior framework covered with sheathing, paper, and clapboards. It is painted orange yellow, with white trimmings. The roof is covered with shingles and stained a moss green. Dimensions: Front, 32 ft.; side, 38 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The reception hall is trimmed with quartered oak, and it has a polished oak floor and an ornamental staircase, with newels, posts, and balusters turned out of oak. The staircase is lighted by a cluster of windows, and is provided with a paneled seat under same. The parlor is trimmed with whitewood, and is treated in white and gold. It has a floor laid with narrow North Carolina pine, with 20-inch border, laid with alternating points at angles, and highly polished. It also has an open fireplace with hearth and facings of amber-colored tile, and a mantel of Oriental design. The dining-room is trimmed with whitewood, finished in a rich mahogany. It has a floor same as parlor, a paneled wainscoting three and one-half feet high, and a corner sideboard built in, with swell drawers below and shelves above, inclosed with leaded glass doors. The butler's pantry, kitchen, etc., are trimmed and wainscoted with North Carolina pine, and are fitted up with all the best modern fixtures. The second floor contains four bedrooms, with large closets and bathroom. The floors are of North Carolina pine, finished in boiled oil. The trim is of ash. The bathroom contains porcelain fixtures, with exposed nickelplated plumbing, and is wainscoted. The third floor contains one extra large room and ample storage room. The cemented cellar contains furnace (Climax), laundry, and other necessary apartments. The house is lighted by gas and electricity. The principal rooms have plate glass windows. Cost, $3,600, complete. Mr. E. J. Parlett, architect, Springfield, Mass., and Mr. W. R. Banning, builder, 50 Dartmouth Street, Springfield, Mass.

Our engraving was made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN COLONIAL HOUSE AT SPRINGFIELD, MASS.

The engravings presented on page 44, in this issue, illustrate a residence erected for Messrs. Gaynier and Augen, at Springfield, Mass. The design is treated in the colonial style, and the principal feature of the exterior is the piazza, with its columns rising up two stories and finished with Corinthian caps. The underpinning is built of red brick, laid up in red mortar. The superstructure, of wood, is covered with sheathing and then clapboards, and painted a colonial yellow with cream white trimmings. The roof is covered with shingles, and stained a moss green. Dimensions: Front, 40 ft.; side, 35 ft., not including piazza or lobby. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior arrangement is most complete. It contains a large open hall, surrounded by numerous large rooms, finished off in a handsome manner. The vestibule is tiled and trimmed with oak. The hall and reception-room are trimmed with oak, and both are separated by base and columns rising up to ceilings, and forming an arcaded effect. The reception hall contains an ornamental staircase, with newels, posts, and balusters turned out of oak, and it is lighted on main landing with windows glazed with delicate tinted glass. The reception-room contains an open fireplace trimmed with tiled hearth and facings, and mantel of oak. The parlor is trimmed with pine, and is treated with ivory white paint. The dining-room is trimmed with butternut, and it has a wainscoting five feet in height and a cluster of windows, two of which are glazed with tinted glass. The butler's pantry is fitted up in a most complete manner, with shelves, drawers, and cupboards. The kitchen is trimmed and wainscoted with yellow pine, and it has a lobby, an icebox built in, with outside entrance thereto, and a pantry. The rear hall and staircase are conveniently located. The second floor contains four bedrooms, large closets, and bathroom. The woodwork on this floor is treated in white, while the walls are tinted in blue, pink, yellow, and green, respectively. The bathroom is trimmed and wainscoted with cherry, and it contains porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and trunk-room. A cemented cellar contains furnace, laundry, and other necessary rooms.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A GAMBREL ROOFED HOUSE AT HARTFORD, CONN.

We illustrate, on page 45, in this issue, a gambrel roofed house, which has been erected for Mr. Charles G. Stone, at Hartford, Conn. The design, which is treated in a simple manner, is thoroughly attractive in its outline and detail, and its combination of good elevations and well-arranged plans is most excellent. The underpinning is constructed of rock-faced stone. The modern superstructure is covered with sheathing, paper, and then cedar shingles, allowed to weather finish a natural silvery gray color. The trimmings are painted a buff color. The blinds are painted olive green. The roof is shingled and finished natural. Dimensions: Front, 27 ft. 6 in.; side, 42 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The main hall is trimmed with cypress, finished natural, and it contains an ornamental staircase turned out of similar wood. This hall is separated from parlor by an ornamental spindle screen. The parlor and dining-room are treated in cream white. The doors are of cypress and stained a dark mahogany. The parlor contains a bay window, thrown out at side, with paneled seat, and an open fireplace built of red brick, and provided with a white enamel mantel. The dining-room contains a cozy nook, and is lighted by a cluster of six small windows. The kitchen and pantries are trimmed with cypress, and are furnished with all the modern conveniences. The second floor is trimmed with cypress, and it contains four bedrooms and bathroom, the latter being wainscoted and furnished with porcelain fixtures and exposed plumbing. The walls throughout are finished rough, and are tinted in strong rich colors. The house is particularly attractive because of its numerous closets, sets of drawers, and cupboards, which are conveniently arranged. The floors are laid with North Carolina pine in narrow widths. The third floor contains the servants' bedrooms and ample storage. A cemented cellar contains a furnace and other necessary apartments. Cost, $4,000, complete. Messrs. Hapgood & Hapgood, architects, 141 Trumbull Street, Hartford, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN RESIDENCE AT NEW HAVEN, CONN.

We present, on page 43, in this issue, a design for a modern residence, which has been erected for Prof. E. P. Morris, on Edgehill Road, New Haven, Conn. It is designed in the modern American shingle style, with gambrel roof lines, and the whole is finely proportioned. The underpinning is of rough water-struck brick. The superstructure, of wood, is covered with cedar shingles and left to weather finish a natural silvery gray color. The trimmings are painted bottle green. The roof is shingled. Dimensions: Front, 46 ft.; side, 35 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The front hall opens directly into all the principal rooms, which are conveniently arranged and trimmed in whitewood, and painted in ivory white. The hall contains an ornamental stairway turned out of cherry. A lavatory is placed beneath staircase. The living-room contains an open fireplace trimmed with tiled hearth and facings, and mantel. The floors are of yellow pine, finished in wax. The dining-room is trimmed with whitewood, and is treated in old English oak stain. The kitchen is of large dimensions, and is trimmed with yellow pine, finished in the natural wood. It is provided with lobby large enough to admit icebox, a pantry fitted up with shelves, lockers, drawers, etc., all complete. The butler's pantry is trimmed with brown ash, finished natural, and is fitted up replete. The second floor is trimmed with whitewood, treated in various tints. It contains four bedrooms, with large closets, two servant bedrooms, with private stairway and bathroom; the latter is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. An open staircase leads up to third floor, which contains a large study, bedroom, linen closet, bathroom, and trunk-room. The cellar contains laundry, furnace, and all the necessary apartments. The house is heated by a combination of hot air and hot water "Magic" heater. It is worthy to note that one looking at the plans of this house might not understand why the front of the house is so largely given over to the kitchen, servants' rooms, bathroom, and storage attic, but the reason why the house is so arranged is in order to have the most important rooms command the beautiful view from the rear of the building. The ground falls away steeply from the terrace on which the house stands, so that the view, even from the ground floor, can never be cut off by other buildings. Cost, $7,000, complete. Mr. L. W. Robinson, architect, 324 Exchange Building, New Haven, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

THE RATHHAUS OF BREMEN.

A masterpiece of decorative art, a most exquisite pearl of the Renaissance in Germany, is the façade of the Rathhaus (Council Hall) of Bremen, see page 54. History says that the author of this work is Lüder von Bentheim.

Lüder was born in Bremen, about 1559, and was descended from a family which had migrated from the county (*Grafschaft*) of Bentheim to Bremen. The grandfather of Lüder, Wilhelm, had been a treasurer of Bentheim. Lüder's father, Hermann von Bentheim, who had settled in Bremen, and had married the daughter of one of the chief merchants, started in business as a stone mason, and was later succeeded by his son. Lüder's skill and conscientiousness earned for him the confidence of the Council. In the Rhederbuch (City Records) he is called "*des Erbaren Rades Stenhover*" (stone mason to the Honorable Council). And from many other records which have been handed down it may be inferred that in all the building plans of the Council he must have taken a prominent part, primarily in his capacity of mason. That in most cases he was also the actual architect can be concluded from his ability and from the fact that the Bremen chronicles mention no contemporaneous builders.

Of Lüder's many works, with the exception of the Rathhaus, but few have been preserved, and between these and the magnificent façade there is so vast a difference that it is difficult to believe the Rathhaus to have been built by him. The most important of his older works are the Public Weighing-House (see SCIENTIFIC AMERICAN, BUILDING EDITION, June, 1898), built in 1587, and the Kornhaus, built in 1591–1592. Both are solid structures, of good proportions, with huge corbel-stepped gables, bordered by bands of volutes, and crowned with pinnacles. Besides these, a number of burgher dwellings of the same general style are ascribed to Lüder. In the rather bare architecture of these older structures there is nothing to remind one of the luxurious magnificence of the Rathhaus. To be sure, there is a difference in time of twenty-one years between the completion of the Weighing-House and the beginning of the Rathhaus. It seems, moreover, that Lüder was assisted by Dutch artists in the erection of the older buildings. A record which has come down indicates that this was the case. Moreover, Gustav Pauli, in an article treating of "The Renaissance Structures of Bremen in their Relation to the Renaissance in Northwestern Germany" (*Die Renaissancebauten Bremens in Zusammenhang mit der Renaissance in Nordwestdeutschland*), has convincingly demonstrated that in many particulars the Rathhaus shows a spiritual relation with the art of Vredeman de Vries, whose books on architecture were much consulted at the time. That Lüder was influenced by Dutch architecture is to be expected from his business dealings with Holland architects. Bremen was at that time the chief market where Dutch builders bought their cut stone. Lüder supplied stone for the Rathhaus at Leyden, built in 1596–1597, for which purpose drawings were naturally furnished. It can therefore be concluded that Lüder traveled more than once through the Netherlands, and that he must have received many ideas for his Rathhaus. Pauli proves, for example, that the balustrade around the roof is an exact copy of that of the Leyden Rathhaus. This Dutch influence would account for the change in Lüder's art-tendencies—a change which can be explained only by a gradually ripened, artistic feeling, due to observation and study.

From the old city records it can be inferred merely that Lüder was the chief mason employed in the erection of the Rathhaus. Other stone masons employed on the structure are hardly mentioned. That he was also the architect and actual builder of the façade is, although a mere supposition, highly probable, since in the history of the city of Bremen no other name is recorded in connection with the erection of the Rathhaus. The very nature of the work, consisting, as it does, of brilliant, ornamental stonework, would lead one to conclude that he was the builder.

The Rathhaus as it stood before the rebuilding, appeared, according to old views, as a plain Gothic, brick building with large pointed windows on the front, ornamented by tracery. At each corner of the upper story were little octagonal, pyramidal towers. A huge sloping roof covered the whole. Even at that time an arcade, the arches of which were supported by sandstone columns, ran along the front. As in the later structure, the main entrance was located at the side. The northwest portion was but little changed during the rebuilding, and shows more clearly the character of the old structure. One of the little old towers has, with the exception of a new top, been left unchanged. Sandstone has been liberally used in the tracery of the large windows of the upper story, in the doors, on the corbels of the little towers, as well as for ornamental purposes. In the central portion of the rear side of the building, facing the small square, a stairway had been built which has since disappeared. An early but feeble attempt at rebuilding is noticeable in a window situated to the left of the northwest portal. Not until 1609 was a more thorough renovation undertaken.

That more than one architect was engaged in the rebuilding of the façade is immediately apparent. It is also noticeable that the smaller gables, usually so excellently proportioned to the main gables, are much too large, in their relation to the main gables. The pillars are not only taller than the stories of the central gable, but are also more richly ornamented. The division of the smaller gables by Hermes is, moreover, not found in the large gable. The peculiar, poor architecture of the hall windows is not in consonance with the other building, and bears more resemblance to earlier structures of Lüder. Finally, in the portico there is noticeable the remarkable baroque formation of the parapet and the strongly marked elements of the pillars, which pillars are opposed to those of the middle projection. The volute decoration of the parapets is readily accounted for by the fact that such ornamentation was common throughout northwestern Germany, and that the parapet was completed after the other portions of the building. But even the consoles supporting the ribs of the arcade vaults, which must have been built at the very beginning, are ornamented with similar volutes, but corresponding more with the forms of the pillars. That the ornamentation varies can be attributed to the different degrees of skillfulness possessed by the stone-masons employed.

Disregarding these absurdities of style, the Rathhaus façade is a most important work—a work which could have come only from the hands of a master fully versed in the art of his time. One cannot help marveling at the deftness with which the ideas given have been used and brought into harmony with the older structure. The excellent motive of the arcade was not lost upon the architect. He took good care not to disturb its effect of repose, and for this reason began the central projecting portion at the lower story. The arrangement of this central structure is most important in the relation which it bears to the façade; for it adds to the monumental appearance of the whole.

The interior was divided into two halls, one lying over the other. The lower hall was richly ornamented with wood carvings and gilt tapestries, and was hence called the "Golden Chamber" (*Guldenkammer*). The upper hall, to which there led a magnificently carved wooden, spiral staircase, probably served as a music gallery during the festivals.

The only remnant of mediæval ornamentation which has come down to us is to be found in the pillars of the façade side windows. The statues of the Kaiser and of his seven electorate princes have been religiously left alone, in spite of their slight artistic value and their Gothic consoles and baldachins. They do not disturb the impression of the whole in any way; they even constitute an essential part of the decoration of the façade, softening, as they do, the contrast between the two-storied architecture of the central projection and the slender hall windows.

The transformation of the upper story was most felicitously accomplished The old, slightly projecting cornice was supplanted by the present rich, effective entablature with its architrave and sculptured frieze. Above the entablature extends a balustrade, surmounted here and there by balls and pinnacles. For the discarded corner towers, corbels carrying statues, and following the lines of the main entablature, have been substituted.

Over this balustrade there rise imposingly the three gables with their elegant band and scroll work, rich pinnacles, and statues. The inequalities in the eight large hall windows, of which the two outermost had from the very beginning been made narrower, the master knew how to employ in bringing the two smaller side gables in closer relation to the main gable—an end which he attained by placing these gables above the central window of each side.

The architectural elements are throughout good, though at times somewhat crudely executed; at the middle structure they are particularly effective and wellnigh perfect in form. An abundance of charmingly conceived elements is distributed over the entire building, even in places where they cannot be directly seen. The gables, the consoles and friezes of the main entablature, and of the central projecting portion, and the arcade constitute a treasure of exquisite ornamental motives.

In spite of the richness of the decoration, the façade never leaves an impression of being overwrought. By means of the strong shadows cast by the arcade, and by the projecting entablature, as well as the proportions of the central portion, an appearance of repose is everywhere maintained. It is to be regretted that the framework in which the window panes are held has been so unskillfully set in place. The effect of light and shade produced by the window panes and by the elegant window posts, consisting of slender, fluted, Ionic pillars with partially ornamented shafts, is lost. By setting the panes back ten centimeters the effect of the windows would be heightened. In excellent contrast to the masonry, gray with age, and to the faded brick red of the walls, stands the gray patina of the copper-covered roof of the old building. Despite stylistic inequalities in parts, the Rathhaus façade is not lacking in unity.

Lüder died in 1613, probably before the completion of the Rathhaus; for, according to the building accounts, which have been still preserved, the last moneys for work done upon the structure were paid to his son. The portions completed after Lüder's death were probably the small gables and the balustrade over the arcade, in which portions the deviations in style are, therefore, not to be attributed to the master-architect himself.—Blätter für Architektur und Kunsthandwerk: Verlag von Julius Becker, Berlin, SW.

Air Insulation in Buildings.

We are told that nothing keeps cold and heat out better than a layer of air; hence the use of horizontal and vertical air passages, and of hollow walls in our buildings. When Russner published an account of some experiments a year ago which contradicted this view, he found, says the Zeitschrift für Architektur und Ingenieurwesen, very few supporters besides men like Astfalck and Nussbaum, who had come to the same opinion from other considerations. Russner's experiments were not unobjectionable. He has now repeated his experiments, and he seems to have established his case. He fixed auxiliary walls more or less close to the other outer walls of a room, heated the inside surface of the inner wall, and measured the temperature on the other face of that wall, and of the air between the two walls. The partition walls were solid or hollow; they were heated by placing heated iron boxes against them, and the temperature of the other surface was determined with the aid of little pockets containing mercury and thermometers, and further of thermopiles. It resulted that the heat penetrated walls one or half a stone in thickness, whether they were solid or hollow, almost equally quick, whilst the propagation through hollow walls packed with sawdust and other insulating materials was much slower. The experiments continued for eleven hours. The propagation of the heat through the air was, of course, the work of radiation, and if the conditions were favorable for radiation then air insulation was not much good. Kieselguhr, slag wool, even peat and sawdust, are much better than an air space, but the latter are too hygroscopic, and therefore unsuitable. Astfalck has rejected narrow air spaces because they favor sweating, which spoils the walls and woodwork, and makes them unhealthy. To keep our walls warm in winter, we may clothe them inside with cork, paper stuff, or kieselguhr, especially if the walls consist of hard burnt bricks or natural stones, which are fair conductors of heat.

Stairs.

The old-time corkscrew stairway is happily becoming a thing of the past, and the more sensible "square" stair, with its broad and generous landings and rests, is rapidly taking its place. It is true the "winding stairs," when properly constructed and artistically designed, added much to the appearance of a hall or main entrance of any building where space was abundant, and cost an unconsidered trifle; but to make a winding stair of any sort a marked feature in a building was always a matter of great trouble, and in many cases could only be accomplished at the cost of some other important feature in the building. The wide, open stair of the present day, with its generous landings, its massive balusters and heavy rail and paneled spandrels, lends itself gracefully to almost every possible condition of architectural or structural requirements, and does not lose any of its best or most useful features by being placed to suit conditions. This style of stair answers the humble two-story cottage, the more pretentious town house, the palatial manor or the public hall alike, and in each place, if treated with a proper knowledge of its qualities, will prove a handsome and useful feature of the building.

In laying out a stair of this kind, it is always best to do so directly under the proposed work, on the floor, where possible, then the position of the newels, balusters, landings, and treads may be properly defined before any of the work is begun.

Where the stair cannot be laid out on the floor over which it is to be built, it is a good idea to use the floor in some unused room for the purpose, when all the measurements for treads, risers, strings, and carriages may be taken, with a certainty that the dimensions are correct. We are well aware that many stair-builders—experts—often build their stairs of this kind, without making a line of draft, being able to get all their lengths and angles from their "pitchboard." This way, however, of building a stair, while all right for the expert, is not recommended for the ordinary workman to follow, as it requires a thorough knowledge of the work in hand and all the conditions surrounding it, which the general workman is not liable to be familiar with.

An easy rise and a broad tread are necessary, in the construction of a stair, to insure a comfortable and easy one to walk on. The landings should be so arranged that it will not require a short or a long step to reach the starting step of the next rise. This may seem a trifle at first sight, but those who have noticed it will bear testimony that a stair where two, three, or four steps taken naturally places the foot on the first tread of the next rise is pleasing and easy in comparison to the stair where the fraction of a step has to be taken to reach the same step, and as the stair is a permanent affair, and the fraction of a step has to be taken every time the stair is ascended or descended, it is a matter of considerable importance that the matter be dealt with while the stair is being designed.

It goes without saying that a stair, no matter of what style it may be, should be solid and unyieldable to the foot. A "creaking" stair is an abomination and a disgrace to the man who built it and the man who designed it. The tendency of the times is to make the treads too thin. A tread should never be less than 1⅛ thick, no matter of what kind of wood it may be made. It should be well connected to the riser and to the strings, either by having blocks glued solid in the angles or having small iron knees screwed to both iron and tread, and to strings, and riser, and tread. The former method is well adapted to private buildings when no heavy weights are carried over the stairs, while the latter method should be employed on stairs that are likely to be subjected to heavy strains.—The National Builder.

Deadening Floors.

We have frequently been asked as to the "best way to deafen floors." The question in that shape is rather indefinite, as the question of cost is not mentioned. If expense is no object, and space abundant, the problem is a very simple one, as the most effectual method of killing sound is to lay two floors, including two sets of joists, the lower tier to carry the ceiling, and the upper to carry the floor, being careful, of course, not to let the upper joists touch or connect in any way with the joists in the lower tier. The ends of the upper joists, if the building is of brick, should rest on a bed of sheet lead, which would tend to break away the sound and prevent its traveling to the joists between. This method is effective, but is expensive, and takes up considerable space, though it does not follow that the joists should be placed above each other their whole width. Suppose the joists 2 x 12 in each tier, this would make the floors over two feet thick if the upper tier were placed over the lower one; this, of course, would be too much space to lose, and it would force us to make too much blank wall between the lintels of the lower windows and the sills of the upper ones, so it is better to place the joists side by side about six inches apart, raising the upper joists about three inches higher than the lower ones. The floor then laid on these joists would be clear of the lower tier altogether, and no connection would exist between the two, thus cutting off all chance of vibration being conveyed to the lower tier of joists. Of course, some provision must be made in the walls by which vibration may not be conveyed from one set of joists to the other. This will be a simple matter if the walls are of brick; if of wood. however, some difficulty will be experienced, as the lining on both sides of the studding will carry the sound from one stud to another, which will, in turn, transmit it to the ceiling joists. If not lined or boarded on the inside, then the lath will carry the sound, though in a lesser degree than lining will.

This difficulty may be overcome by having the studs carrying the joists made one inch narrower than the studs forming the wall. Suppose the wall to be four inches thick, without counting sheeting or lining. This would be far more with scantlings 2 x 4, set at proper distances. The ceiling joists proper would be spiked to these or else rest on the edge of a lining board or ribbon piece. Now, if we place between these studs, at proper distances, 3 x 3 scantlings, leaving their inner and outer faces one-half inch clear of the wall on both sides, and then spike our joists on these, we get perfect insulation, as any vibratory occurrence would be conveyed direct to the foundation, providing, of course that care is taken not to connect in any way the upper joists with the linings or sheetings. This method of deafening, while almost perfect if properly constructed, is not to be recommended for ordinary work, owing to its cost aad absorption of space. We might say, *en passant*, that floors laid as described in the foregoing would answer for ballroom or dancing hall purposes, as the floor could be made "springy," while the ceiling below need not be affected. When a floor is intended to be "springy," the joists form

fng the carcass should not be tied to the wall, as it is evident they would draw the walls inward as they deflected, and if the floor was danced upon, the walls would be badly shaken and rendered dangerous. The joists should be left loose ended in the walls, and should rest on hardwood or metal bearings to admit of their sliding too and fro without disturbing the wall.

An almost universal custom of deafening floors is to introduce a two-inch layer of poor mortar between the joists. The method of doing this is as follows: At about the middle of each joist, and on both sides, nail on strips one inch thick and one and a half or two inches wide, the whole length of the joist; then cut in rough boards of hemlock, spruce, or pine, keeping the joists close and resting the ends of the boards on the strips. When this is finished, put in the rough mortar or "pugging," say, from two to three inches thick, and level up with a plasterer's float, keeping the mortar well up to the sides of the joists. There are several objections to this method, among which may be mentioned: First, it loads down the floor, and has a tendency to "sag" it. Second, it is not efficient, indeed, as a non-conductor of sound; it is quite feeble, as the joists convey sound from top of floor to ceiling. Third, the greatest objection is its tendency to decay the timber work wherever the lime mortar comes in contact with the wood. In this case heavier josts will be necessary, and they will require to be closer together, and this, with the additional expense of putting on strips, furnishing and cutting in the boarding, supplying mortar, or "pugging" and floating it in place, makes the whole work much too expensive for the small results obtained.

Sometimes, instead of pugging being used, exhausted tan bark is employed, which answers very well as a deafener, but it has several bad qualities; it encourages certain kinds of insects, and it is not of pleasant odor.

Mineral wool, which is made from slag, and is noncombustible, is a favorite material to use for deafening floors or walls, but is too expensive for use in ordinary houses.

Another method of deafening, which is really better than any we have mentioned, both as to results and costs, is as follows:

Before laying the floors, see that all the joists are in line, then take strips of heavy "felt" or "quilt," a little wider than the thickness of the joists. Tack this on the top edge of the joists, and on the top of this "felt" or "quilt" lay the floor in the usual manner, taking care not to crimp the "felt," or break it so that the flooring will come in contact with the joists direct.

A splendid "felt" or "quilt" is manufactured in Boston, Mass., the main part of the cloth being composed of eel-grass, which is not affected by decay, it being as lasting as white birch bark. It will not burn, and, containing several strong chemical qualities, rats, mice, or other vermin fight shy of it. It is easily handled, and not readily torn to pieces, and is not expensive; qualities all of which recommend it for general use.

Another, and in our opinion the best, method of deafening, all things taken into consideration, is as follows: Line up the joists, have them bridged well and firmly, then cover with planed and jointed boards; do all plastering and other rough work in the rooms that have to be deafened; clean off the floor, seeing that all lime spots are removed or killed; then lay on this floor a layer of medium thick "felt" or "quilt," marking the lines of the joists. When the "felting" is all done, place half-inch strips of pine or spruce over the line of joists, the strips to be about two inches or more in width. Nail these strips on the joists with flat-headed wire or French nails of proper length; then on the top of these strips lay strips of heavy felting about three inches wide. On these strips lay the floor, and if the work be well done the noise of a brass band will hardly penetrate through to the other side.

This method may be adopted in deafening the walls and floors of bathrooms, or in special wards in hospitals, and many other places. It also acts as a non-conductor of heat or cold, and for these reasons might be used where deafening was no object, but where the regulation of temperature was of much importance.

It often happens that a soil pipe leading down from a water-closet or bathroom is placed in some position that the noise from it is so disagreeable and annoying. If in the wall between studding, the sound may be deadened by building brickwork and mortar around it, or packing mineral wool or eel-grass around it. If the soil pipe should happen to be exposed either in a hallway or in some room, it had better be boxed in with a square box, leaving an inch or so all around clear of the pipe, then fill in the box from top to bottom with a mixture of lime, sand, and plaster of paris, in about equal part, or with lime and good hair mortar, and the noise will make no further trouble in that room or hall.

In some places, we believe it is the practice to take sawdust and steep it in lime whitewash, and then spread it out in the sun to dry and use it for deafening in both walls and floors. This makes a very healthy filling and is proof against insects, rats, mice, and fire. Planing mill shavings treated the same way also make a good non-conductor of sound, and may be used with effect for packing about soil pipes or in partitions or floors. There are several other methods of deafening, some of which have been used for centuries, but, as they are scarcely adapted to the wants of the modern mechanic, we will not discuss those now, but may in the future.—The National Builder.

Pure Water in the Country.

To those who value their health and that of their family, to those who would have strong and thrifty animals, to those who desire pure milk and first-class butter, we would say that it is of primary importance that the water supply should be from a source beyond suspicion, and that this source should be carefully guarded against pollution. This statement, quoted from a report of the Canada Experimental Farm, calls attention to a subject the importance of which is not fully appreciated on many farms. The experiment stations have made thousands of examinations of samples of drinking water, and these have shown that a very large proportion of the water used on farms, especially well water, is polluted and unfit for use.

In the majority of instances the pollution, as shown by the chemical data, is derived from the drainage of the farm buildings and barnyard, and is consequent upon two causes—the location of the well and the dirty condition of its surroundings. When that most pernicious practice of sinking the well in the stable or barnyard is followed, provision is really being made to collect, as in a cesspool, liquid manure. The amount of manure, the rainfall, and the porosity of the soil are the chief factors that will determine the rapidity and extent of the contamination of such wells; it is only in very exceptional cases that they can escape pollution. Let those about to sink wells, therefore, remember that they should not be dug in or near the barnyard nor under the farm buildings. Not a little of this rural well water pollution is due to the filthy state of the buildings and yard.

The well being sunk at a safe distance from possible sources of pollution, the brick and stone work should be coated to the ground water line with a cement impervious to water. This will protect the well from infiltration of drainage from the upper layer of the soil. Further, a tight-fitting top should be provided, rising to the height of nine inches or one foot above the surface of the surrounding ground. This will prevent surface water, mice, rats, and frogs from entering. The household slops, garbage, etc , should never be thrown on the soil in the neighborhood of the well; their proper place is the compost heap. Finally, the well should never be used as a cold storage receptacle, nor the dairy or other vessels washed at the well unless there is an ample provision by a well-constructed drain to take away the wash water.

A well in which water rises suddenly after a heavy rain should be regarded with suspicion unless the surroundings are scrupulously clean; for, as Professor King states, "a sudden large rise and fall of the water-level in a well, associated with heavy rains, can have no other interpretation than that water reaches the well without being filtered through a very large amount of soil. An abrupt rise and fall of a few inches might have no significance, but where there is a rise and fall of a foot or more there can be no doubt but that the well is liable to yield, at times, unsanitary water, if the surface surroundings are such as to permit it."

It is not the farmer alone who is interested in a pure water supply on the farm.

The health of the large communities of people who draw their food supply from the country is, in a measure, dependent on the health of the farming community. There is scarcely a city child who is not, in a degree, dependent for its health on the sanitary conditions prevailing in the house of the dairyman. Milk has been repeatedly shown to be the means of distributing typhoid fever and other diseases. Any vegetable foods from the farm, eaten raw, are liable to become carriers of infection under unsanitary conditions.

Slate for Roofing.

THERE are many localities in the United States where the merits of slate for roofing are comparatively unknown. One does not have to travel far in any direction from the slate centres to find towns and villages where scarcely a slate roof can be seen. These places offer good fields for missionary efforts on the part of the slate men, who have heretofore been entirely too conservative in pushing their business. When the public is thoroughly educated as to the many advantages a slate roof affords over other material there will be no difficulty in getting rid of double the present production. A comparatively recent use to which slate is being put is in the manufacture of fittings for electric light plants. Slate has been found to be one of the best non-conductors, and is of great value in the electrical business, as is shown by its already extensive use.—Engineering and Mining Journal.

To Age Oak.

AMMONIA applied to oak produces the bronze olive tint now used so much by architects. Staining by the fumes of ammonia results in all shades from light olive to the rich deep brown of extreme age. This method is considered the best for imparting to oak or mahogany the appearance of age; and for those wishing to avail themselves of any easy, clean, and certain means of gaining the result, fumigating offers no serious obstacle to its accomplishment, the articles necessary being easy of acquirement and at small expense.

Procure for your use a box sufficiently large to receive the article; any well-made packing box will be suitable, providing the joints or seams are close. Next get some strong, full-strength liquid ammonia, not the diluted article of the druggist, pour some in a shallow receptacle —such, for instance, as a deep plate; place this in the bottom of the box, so that the fumes will rise and surround the object to be stained; close the box securely, so that the fumes will be confined as much as possible. When the article is small, of course, the box need not be large—the smaller the better, for then you will not require so much ammonia. You can see how the staining progresses by wetting a portion from time to time; otherwise the change of color would not be perceptible. All that is now necessary is to leave the ammonia to do the work, remembering that the longer the exposure the darker the hue will be.—The National Builder.

The Marble Columns for the Baltimore Court House.

A DISTINCTIVE feature of the new court house in Baltimore will be eight marble monoliths. In their finished state these columns will each be 32 feet long, 4 feet 3 inches in diameter, and weigh thirty-five tons apiece. While there are columns of greater size on buildings elsewhere, the Baltimore Sun says, there are no marble monoliths that equal the proportions of those that will adorn the Baltimore building. Marble columns even of equal size in other cities are built up in sections or drums, and are not composed of a single stone. The marble monoliths on the Capitol wings in Washington are not as large. On the north and south fronts of the Treasury Building in Washington there are granite monoliths of this size, but, owing to the regularity of granite at the quarries, it is not considered a difficult task to turn out monoliths of such proportions. Over a year has been spent in quarrying the court-house monoliths, and before stones of sufficient size could be gotten out many times the weight of these monoliths was quarried. The drilling and channeling process necessary to get out such huge stones required expert work, and many failures were experienced before the attempt was successful. Another serious problem was to get the marble of the proper color.

Rules for Measuring Slate Roofing.

IN order to find the required amount of slate to cover a certain given area of roofing, take three inches from the length, or as many as the third covers the first, divide the remainder by two, and multiply the quotient by the width of the slate, and the product will be the number of square inches in a single slate; multiply the number of square inches thus procured by 144 (the square inches in a foot), and the quotient will be the answer.

A square of slating means ten feet each way; or a hundred square feet when upon the roof. When slate is bought and sold by the square, nothing being said of the measurement, it is invariably the rule to allow three inches for the distance the third covers the first; or, as slaters say, three inches second lap.

The contents of a roof is found by multiplying the length of the ridge by the girth from eave to eave, and in slating just so much allowance must be made for the double row of slate at the eave as there would be in a single row of slate. For example, if the slate be 16 inches long, they will lie 6½ inches to the weather. So, 6½ inches should be allowed.

On valleys and hips one foot is allowed for the extra labor of cutting, fitting, and laying, as well as the waste of slate. For example, if a valley or hip is 20 feet long, 20 feet will be added to the surface measure of the roof.

There is no deduction made for chimneys, scuttles, or other necessary openings, unless they are more than four feet square, owing to the extra trouble and waste of material in working around them.

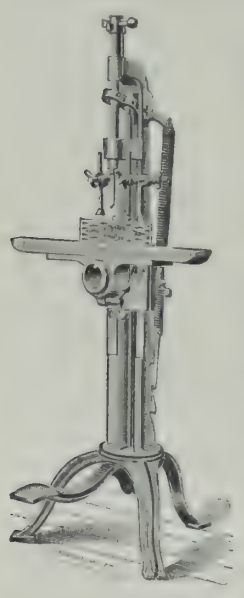
Sand Roofs.

A VERY singular way of roofing is now not unfrequently employed in Paris for small dwellings. The roof is given a very gentle slope only, and is covered with battens and tarred cardboard, and then covered with a layer 3 to 4 cm. thick of sifted clean gravel. The most violent rains fall dead on such a roof, and neither hail nor sun has any effect on it. Even walking on it will cause no injury to the cardboard. Rain percolates through the gravel and runs off regularly, and habitations thus covered are much less exposed to the extremes of heat and cold which make themselves felt under zinc. It is necessary to rake up the gravel from time to time and to bring it back, as it works its way down the slope of the roof. When it has become earthy by being full of dust it is changed, but can be used again after a good washing. Thus the last cry of modern industry is a return to the earthen roof of our ancestors. The tarred cardboard is, however, an essential part of the scheme, as it prevents the passage of damp.—Invention.

AN IMPROVED MORTISING MACHINE.

The machine illustrated in the accompanying engraving is strong and substantial, has powerful motion, accurate action, and a large range of work.

It is made entirely of iron and steel, except the hardwood strip on top of the table. The novel construction of the frame renders the machine extremely strong and solid.



"DIAMOND" MORTISING MACHINE.

The treadle motion is arranged in such a manner as to obtain great leverage and power on the chisel-spindle without special strain on the working parts.

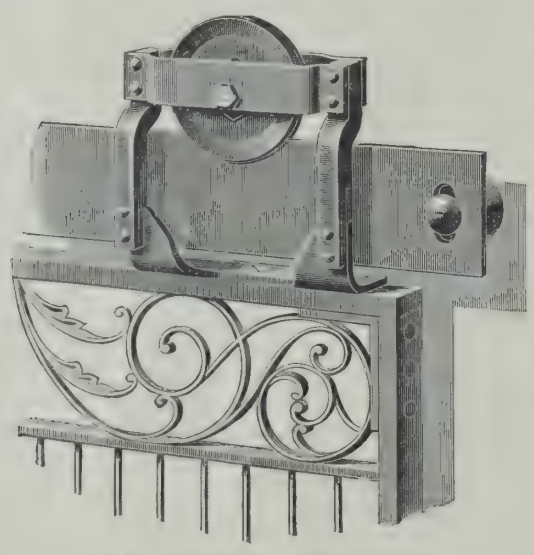
The table has easy, accurate, and positive adjustment, vertically, horizontally, and angularly. The angle adjustment is a valuable feature that will be appreciated by all mechanics. By means of a graduated scale, the operator can tilt the table either to the right or left to mortise or cut work on any desired angle.

The chisel-reverser is attached to the upper end of the chisel-spindle. The working points are milled to a gauge. A stop is provided to secure perfect accuracy in reversing the chisel.

The machine will mortise ¼ to 1 inch wide, 3 inches deep from one side, or 6 inches deep by reversing the work. Each machine is provided with three mortising chisels. The machine is manufactured by the Seneca Falls Manufacturing Company, 276 Water Street, Seneca Falls, N. Y. A catalogue will be sent on application.

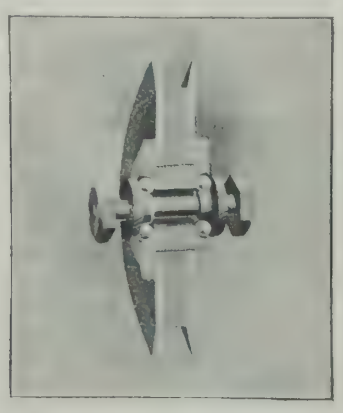
THE LANE ELEVATOR DOOR-HANGER.

The annexed cuts illustrate a new style of hanger, which Messrs. Lane Bros. Company, of Poughkeepsie, N. Y., are placing upon the market. The hanger is designed especially for use on passenger-elevator doors. At present, hangers for this purpose are usually selected from some of the numerous styles of parlor or house door-hangers, none of which, it is claimed, is suited for the purpose. One of the most potent causes of trouble is the



LANE ELEVATOR DOOR-HANGER.

fact that the loose or adjustable parts of the hanger wear abnormally, on account of the slamming of the doors. As will be seen from the illustration, the hanger in question has a solid steel frame, fitted with a ball-bearing wheel, and having no joints or loose parts. Particular attention is called to the great amount of use to which such hangers are subjected, and the necessity of thorough durability. We present a sectional view of the wheel and bearing used in this hanger, which is the same as



SECTION OF THE WHEEL AND BEARING.

that supplied with the company's ball-bearing parlor door-hanger. It is claimed that the cups, cones, and balls are made in the best possible manner. The track is supported at the ends only, thus reducing to a minimum the work connected with erection. The adjustment is accomplished by means of the track.

BRISTOL'S PATENT STEEL BELT-LACING.

It is now nearly ten years since The Bristol Company, of Waterbury, Conn., began to manufacture their patent steel belt-lacing, which has become within that time familiarly known and very generally used at home and abroad. Over one hundred different sizes and widths of belting are made and adapted to different styles. Of

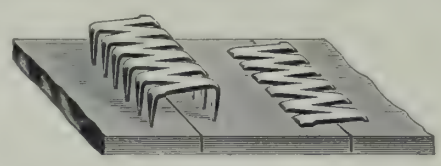


FIG. 1.

the illustrations showing the three different types that are manufactured, Fig. 1 represents that originally placed upon the market, and designed particularly for leather belts.

The type illustrated in Fig. 2 was brought out later to meet the demand for a fastener for woven belts of cotton and rubber. In this style the distance between the rows of spurs is greater than in the original form shown in Fig. 1, thus affording a better hold on the ends of the belt. Both types of the lacing shown in Figs. 1 and 2 have the patented feature of being formed from blanks of

FIG. 2.

a zigzag shape, the form being such that the blanks may be successfully cut from a ribbon of steel without waste of material.

The latest design, shown in Fig. 3, combines the special features of both the previously described types, the essential difference being that there are two rows of spurs on each side of the center instead of one. The patented features of this latest design are that the blanks used are of a zigzag form, and that they may be successfully cut from a ribbon of steel without waste of material, each blank as it is cut off simultaneously forming one side of the blank for the next lacing.

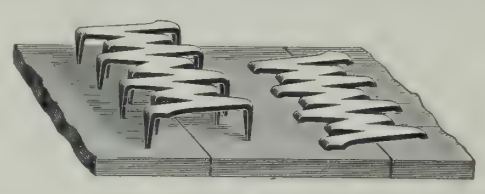


FIG. 3.

The advantages of this new form of lacing are that it is equally applicable to leather, cotton, or rubber belts, and that the double rows of spurs on each side of the joint insure great strength, especially when applied to old and partially worn belts. All the foregoing types have been carefully designed to give maximum strength with minimum amount of material, and are easily applied without the use of special tools.

Samples will be mailed free on application to the makers.

Architectural Casts at the Turin Exhibition.

American architects and others in Italy, writes a correspondent from that country, will be interested in knowing that in the exhibition now open at Turin there is a large and splendid collection of architectural casts—capitals, doorways, bas-reliefs, etc., mostly mediæval—from the province of Bari, revealing such a richness and beauty in the ancient art of Apulia as must astonish nearly all who see the exhibit. The casts were made at a cost of 100,000 lire, and, as the moulds were not preserved, this collection must remain absolutely unique. It is to be hoped that it will be permanently housed at Turin. The exhibition has other claims to attention, especially from artists and archæologists. A large division appropriated to sacred art has a retrospective show of paintings, sculptures, and objects of ecclesiastical art of all sorts, gathered from churches, sacristies, and private collections. Among these treasures is a superb crucifix, the Christ in ivory and the cross in silver, a *chef-d'œuvre* of Renaissance art, once presented by a Pope to a member of his own family, and preserved by his descendants to this day. The present representative would be glad to sell it, and it were much to be desired that so splendid a work should be acquired for America. There is also in this division a collection of photographs of mediæval churches in Piedmont, general views and details, complete beyond anything to be seen elsewhere. The study of these is but a temporary privilege, as they are the work of a distinguished amateur, and not for sale nor even often to be seen. Some of the exhibition buildings, in the rococo style peculiar to Turin, are well worth attention. The entrance pavilion, with its fountain, its setting off park, and its background of richly wooded hills beyond the Po, forms a picture of rare beauty.—New York Evening Post.

MOUNTED TILE FOR MANTELS.

A method of mounting tile-facings and fire-boards on slate has been employed by the Alcott, Ross & Scully Co., of Philadelphia, with entire success in the shipment of mantels for out-of-town trade. In localities where a good mason cannot be readily obtained, the problem of setting a mantel has often been so serious as to deter builders and home owners from an investment that would pay richly in the added beauty and comfort of the

house. The hardwood mantels made by the Alcott, Ross, & Scully Co. are more easily set up than brick mantels; and when, in addition, the tiles are ordered mounted on slate, the work remaining for the local mason is so simple that there is practically no danger of bad work. Tile set at the factory by this process has satisfied the most severe critics, and the company guarantees the material, workmanship, and mechanism fully equal to that obtainable anywhere.

Priming on New Wood.

When the wood you are about to paint is new, the priming should be laid on as thin as possible, to allow of the oil sinking into the wood, on which it exercises a preserving influence. As the thinness tends to delay its drying, if the priming color be one that it is naturally hard to dry, do not mix it with plain linseed oil, but with one part of drying oil.—The National Builder.

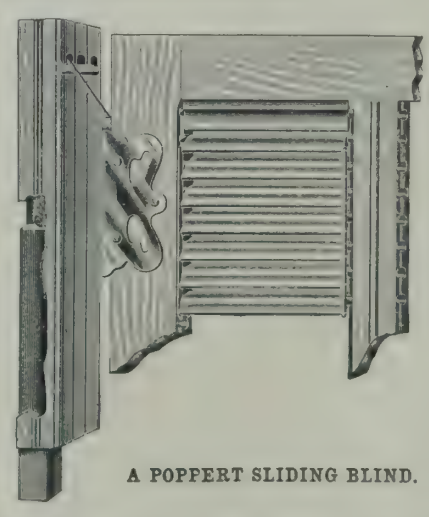
MODERN SLIDING BLINDS.

Of late there have been placed upon the market various kinds of sliding blinds, the manufacturers of which have vied with one another in perfecting a blind that would combine elegance and convenience with moderate cost.

Of the many kinds that are at present manufactured, those made by the George Poppert Manufacturing Company, Milwaukee, Wis., are entitled to special consideration.

The blinds made by this company are hung like an ordinary sash, and are counterbalanced by lead weights, guided in boxes secured to the face of the jamb. Since the weights are counterbalanced the blinds are more easily operated than those supported by springs, which latter can be moved only by the full strength of both arms.

Mr. Poppert uses cords that are run over glass cylinders, thereby avoiding the trouble caused by cords' slipping off and the squeaking of pulleys. The construction is so simple that the blinds cannot get out of order. Wood sliding in wood is always subject to swelling. To avoid this, the blinds are held in place by metal attachments, and are therefore never affected by the weather. The blinds can be taken out to be cleaned, the guideways remaining unchanged in their places, and not interfering with curtains, shades, or window ornaments.



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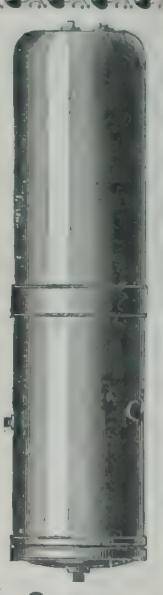

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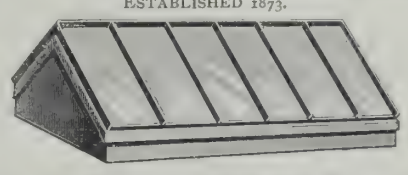

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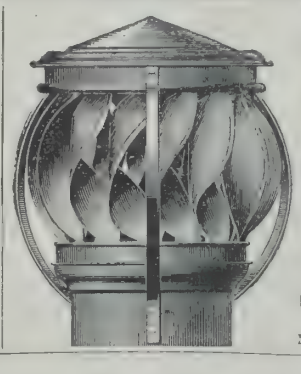

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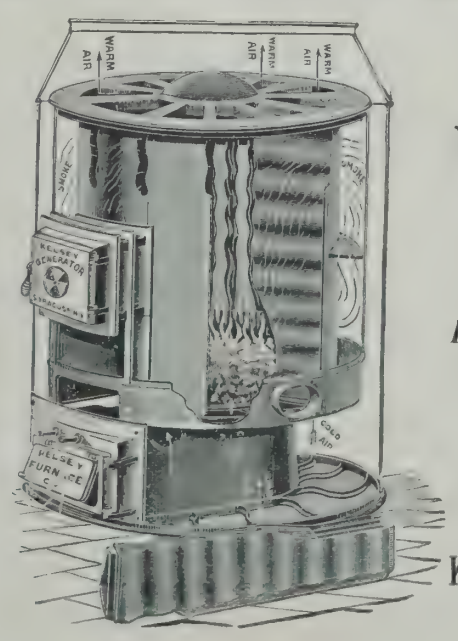

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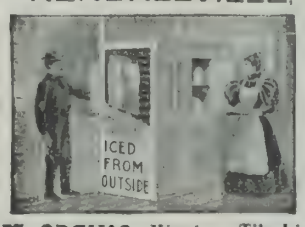

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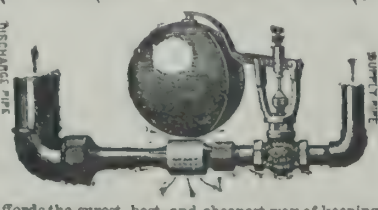

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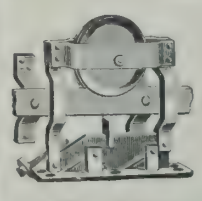

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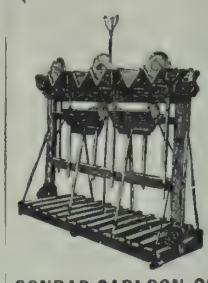

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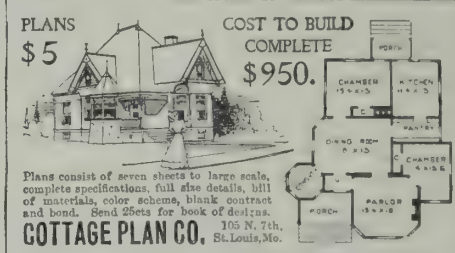

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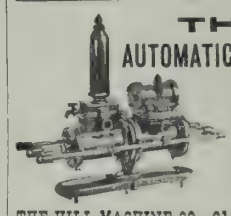

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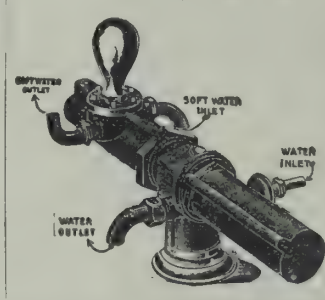

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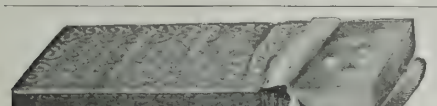

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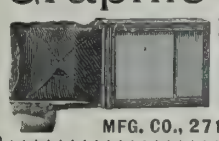

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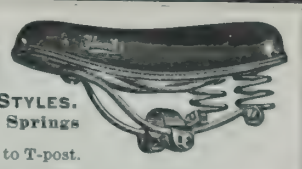

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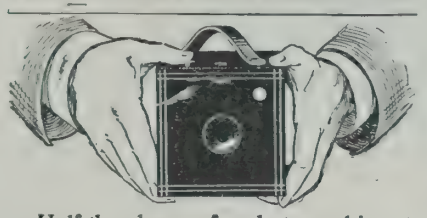

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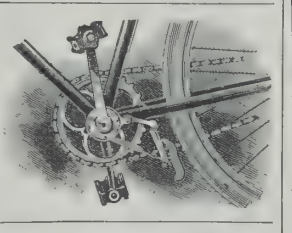

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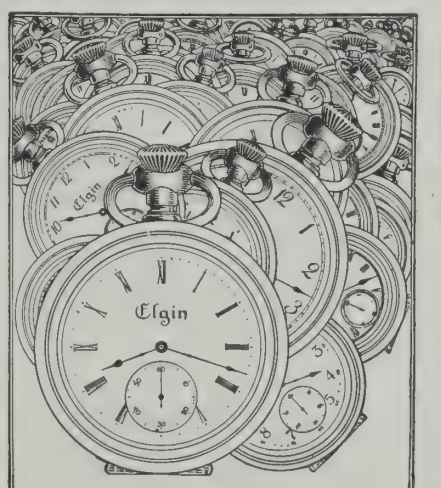

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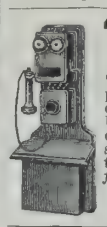

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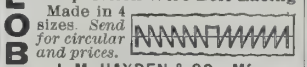

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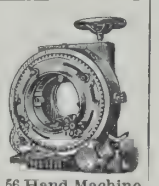

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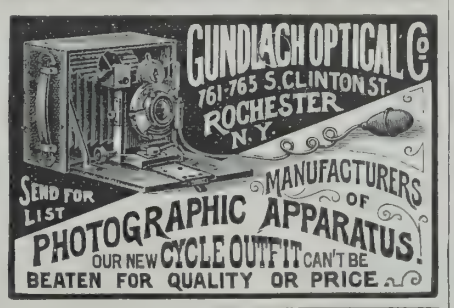

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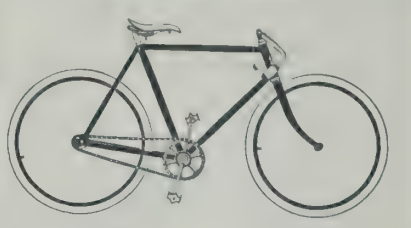

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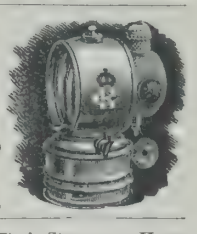

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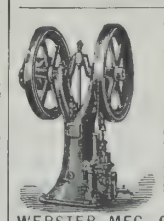

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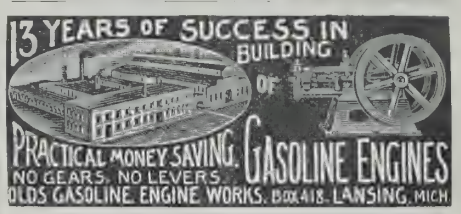

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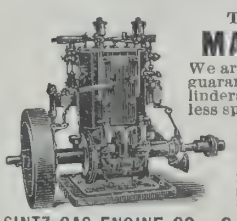

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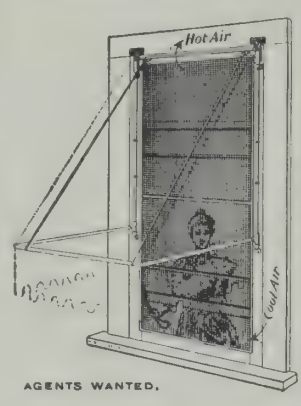

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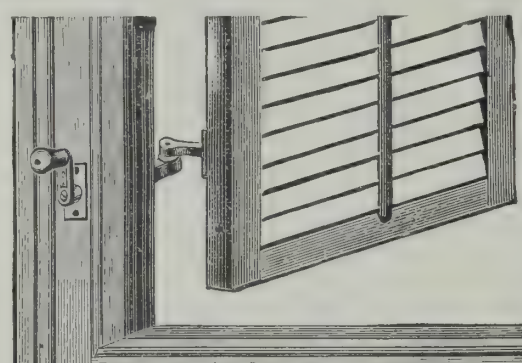

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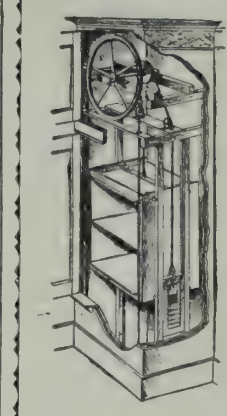

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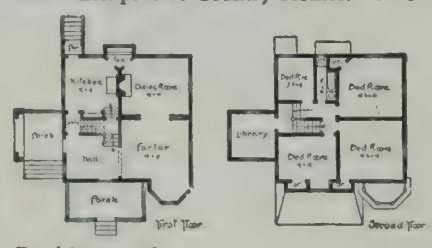

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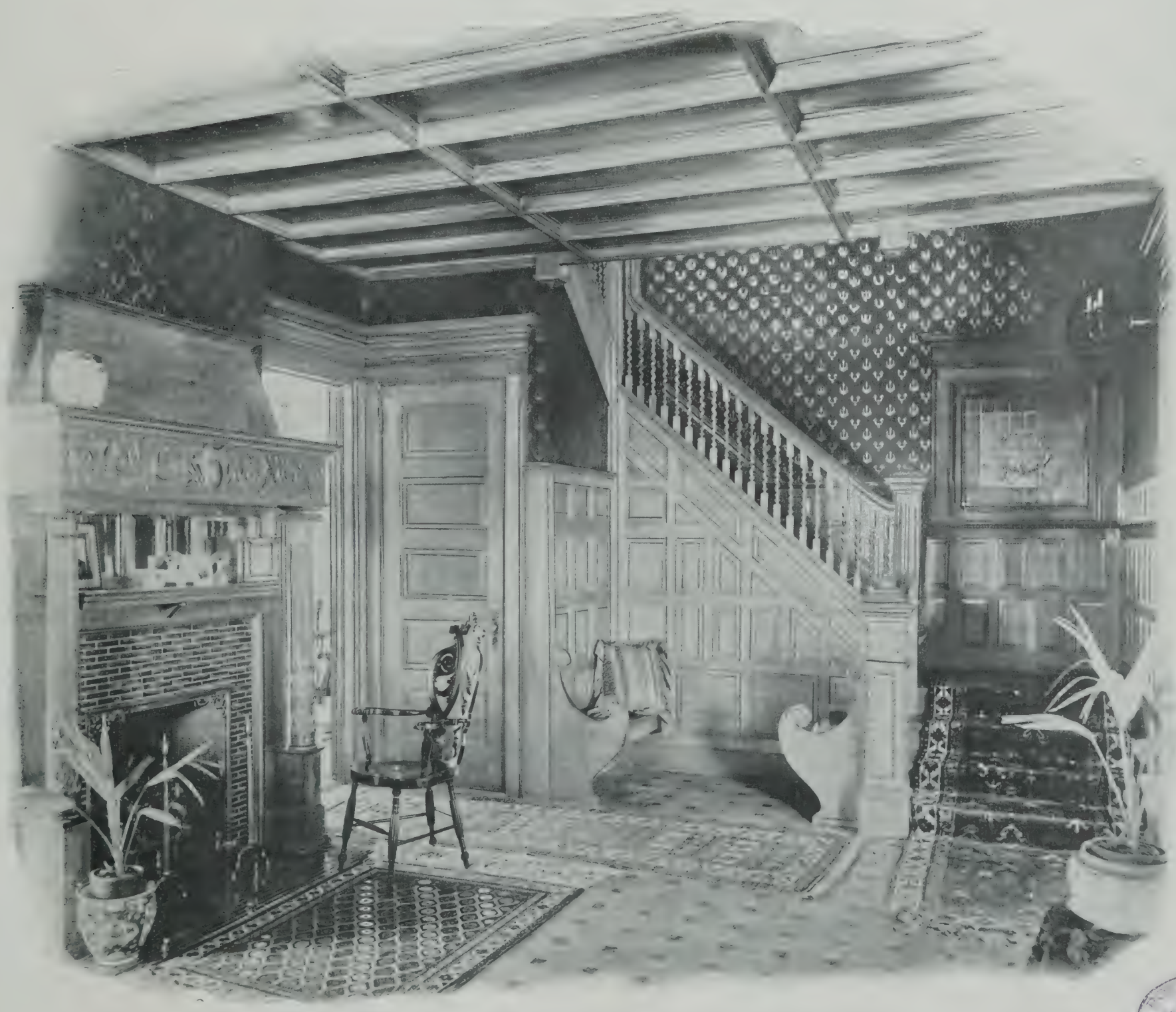

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THE VALUE OF NATURAL SCENERY.

The latest report of the Commissioners for the State Reservation of Niagara brings to the front, in an acute form, the time-honored discussion of the value of scenery to the world. The report discusses the recent notable changes which have taken place at Niagara through the utilization of a relatively small part of its energy, and falls foul of Lord Kelvin for his frankly avowed wish to see the whole of the energy of this great cataract, one of the natural wonders of the world, turned to some useful purpose. On his last visit, during the sessions of the British Association at Toronto, in 1897, he witnessed the present waste of power "with more or less conscious disturbance or disapproval." He was, therefore, set down by the Commissioners as a vandal in the same pillory as the contractors who have blasted away some of the most interesting parts of the Palisades on the Hudson River. Viewing what has been done in developing the electrical power of Niagara, the report says: "The question may well be asked, 'Has the interest in natural scenery of exceptional grandeur that promoted and approved the establishment of the State Reservation at Niagara and the Queen Victoria Niagara Park, wholly disappeared?' Or has the interest in the development of the electrical power and manufacturing enterprises become so general and so dominant as to produce indifference to the future of Niagara Falls, and even tacit approval of schemes that cannot but be effective in diminishing the volume of the cataract, and defacing it as a world famous spectacle? At any rate, it must be admitted that the river and the Falls are at present not safeguarded from destruction, and the only power that can provide absolutely sure protection is the combined power of the United States and that of Great Britain."

It is very safe to say that the injury to the waterfall itself is not appreciable at the present time. It has been estimated that the power available to the Falls is at least 6,750,000 horse power. Various privileges have been given for the use of the Falls to develop 500,000 horse power, and the amount which is now used is somewhere between 50,000 and 60,000 horse power; therefore, the legal limit at the present time is less than one-twelfth of the capacity of the water falling over the Falls. The thickness of the sheet of water at the Horseshoe is over sixteen feet, so that, if 500,000 horse power is developed, it will only be a foot and a quarter thinner, with a proportionate shallowing toward each bank of the river, and the same would be true for the American Falls. It would, of course, be impossible to note such a slight diminution as that. What is to be feared, however, is the erection of unsightly buildings along the banks, and there seems to be an excellent field for the Commissioners to require that every building which is erected should conform, to a certain extent, with those which have been previously built. It costs but a very little more to construct a factory building which shall have some architectural pretensions than to build one that has none. If the matter was presented to those who have the concessions for power, we think there would be no difficulty in making them see that it was for their interest that the Falls and their surroundings should not be injured by unsightly structures. A supervising architect should be appointed to look after the architectural interests in the towns surrounding the Falls and the Niagara River, if for no other reason than the purely selfish one of silencing hostile criticism. This alone should make property owners devise some such scheme, for sooner or later the respective legislatures of the two countries are very likely to do something which would tend to curtail the use of the power which nature has provided so abundantly. If artistic factory buildings, which did not disfigure the natural scenery, were built, it would tend to soften legislation.

WORK ON THE NEW YORK PUBLIC LIBRARY.

The report of the Executive Committee of the New York Public Library was presented on March 8. The library authorities are now assured that the Board of Estimate and Apportionment will probably be able to appropriate $1,000,000 for the work for the present year, and $500,000 thereof as soon as the requisition of the Department of Public Works, in due form, is presented, so that there are now good grounds for believing that the splendid library building which New York has wanted for so long a time will, at last, be begun. The causes for delay in the actual commencement of the work are well known, and have already been referred to in these columns. In reality, no time has been lost, and the interval since the adoption of the plans has been most valuable as giving an opportunity for their study and development. At least one great library in the United States suffers extremely from very bad planning, so that the changes which have been made in the designs for the New York Public Library are probably for the better, and will facilitate the work which the library is to carry on. The library has now 465,000 volumes and 180,000 pamphlets. To provide for the great number of books and pamphlets received, there have been added over five linear miles of shelving, of which nearly one-half has been placed in the Lenox Library building. A bindery on a moderate scale has been established at the Astor Library, which is chiefly used for repairing.

NEW YORK CITY'S PARKS.

Doubtless few of our readers know that the Park Commissioners of New York city have under their authority over 6,000 acres, yet this is the case. The old settlers of Manhattan would certainly open their eyes in astonishment if they could see the marvelous changes which have been wrought since Bowling Green was considered the ideal park. Central Park on a May day, or in fact upon any pleasant Saturday or Sunday in spring or summer, is a sight which cannot be witnessed elsewhere in America, and which has few parallels abroad, so that it is not at all surprising that the great pleasure ground is an objective point for visitors from all over the world. Bowling Green was the beginning of the park system, this small square led to a desire for Battery Park, which overlooks one of the most beautiful harbors in the world.

The New York Tribune recently published an interesting list of the city's parks, with their acreage, taken from the records of the Park Commission. The table is as follows:

	ACRES.
Abingdon Square	.202
Battery	21.190
Beach Street	.038
Bowling Green	.517
Bryant	4.775
Boston Road and 164th Street	.060
Boston Road and 169th Street	.160
Central	839.921
Canal Street	.318
Christopher Street	.139
City Hall	8.239
Cooper Union	.229
Cedar	17.470
Duane Street	.108
East River	12.546
Five Points	.114
Fourth Avenue	5.630
Fulton Avenue and 167th Street	.200
Fulton Avenue and 170th Street	.950
Fort Washington	12.000
Grand Street	.630
High Bridge	23.380
Jackson Square	.227
Jeannette	.870
Manhattan Square	19.051
Madison Square	6.840
Morningside	31.238
Mount Morris	20.174
Park Avenue, 34th to 40th Street	1.168
Riverside Park and Drive	177.800
Stuyvesant Square	4.229
Tompkins Square	10.508
Union Square	3.483
Washington Square	8.115
Corlears Hook	8.300
St. John's	1.700
Mulberry Bend	.552
Rutgers	.450
Van Cortlandt	1,132.350
Bronx	661.600
Pelham Bay	1,756.000
Crotona	141.650
St. Mary's	28.700
Claremont	38.050
Total	6,002.383

RAPID WORK ON A LARGE BUILDING.

The Vincent Building at the corner of Broadway and Duane Street, which was recently constructed from the design of George B. Post, is particularly notable for the speed with which it was built. The old buildings were torn down in May, 1898, and it required considerable work to make a sure foundation. The structure proper was begun on August 26th, and the steel framework of the fifteen-story building was rapidly put up. On December 24, the last brick was put in position on top of the superstructure. In four months, the building, which really begins twenty-five feet below the level of the sidewalk, had been erected, and on January 1 the plastering was begun. This is an excellent example of the rapid construction of high buildings in New York.

A RESIDENCE AT YONKERS, N. Y.

The engravings presented herewith, on pages 59, 64 and 65, illustrate a residence recently completed for E. E. Allison, Esq., at Philips Place, Yonkers, N. Y. The illustration shows an excellent example for a gambrel roof house, and its exterior has many fine features and good detail. The first story, balustrade to piazza, and terrace, are constructed of rough, rock-faced, ashlar Pelham trap rock. The building above, of wood, is shingled on the exterior and stained a dark green color. The roof is shingled, and stained similar. The trimmings are painted cream white. Dimensions: Front, 45 ft. 6 in.; side, 40 ft. 6 in., not including piazza and terrace. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The hall is trimmed with quartered oak. It has a paneled wainscoting and a beamed ceiling, and also a grand staircase, with newel posts, rail, and balusters. This staircase has a nook with seats, and is lighted by stained glass in an effective manner. The open fireplace is furnished with tiled facings and hearth, and a mantel handsomely carved. The floor is laid with parquetry. The parlor is separated from the hall by a square archway, with columns. This room is trimmed with oak, and it has a floor laid in parquetry, and an open fireplace, furnished with a tiled hearth and facings, and a mantel with mirror, columns, and carvings. The library is trimmed with oak, and it has a dark green filling resembling forest oak. It also contains a fireplace, built in, with the usual trimmings, and with bookcases on either side, and floor of parquetry. The dining-room is trimmed also with oak, and it has a cluster of windows opening out upon terrace, and a buffet built in and treated with leaded glass effects. It has a parquet floor. The kitchen and its dependencies are furnished up with the usual fixtures complete. The second floor contains four bedrooms and bathroom, the latter being wainscoted with tiles to the height of five feet, while the floor is paved with unglazed tiles. It contains porcelain fixtures and exposed nickelplated plumbing. The third floor contains three servants' bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary rooms. An interesting feature to those interested in heating apparatus is the placing of the radiators in apertures made for them in the foundation walls. In this manner either hot or cold air can be admitted through the registers, regulating the temperature as well as giving fresh air when required. Cost, $10,000 complete. Mr. G. G. Lauryens, architect, New York, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODEL COTTAGE AT HOMEWOOD, BOROUGH OF BROOKLYN, NEW YORK, N. Y.

We preface the description of "A Model Cottage at Homewood" with a few remarks relative to the property upon which it is built. The land upon which "Homewood" is building was purchased by the City and Suburban Homes Company in 1897. The tract is located between Sixteenth and Eighteenth Avenues, and Sixty-seventh and Seventy-fourth Streets, Borough of Brooklyn, and within close proximity to Bath Beach, Bensonhurst, and Borough Park. The object of the company is to provide artistic and comfortable homes containing all the modern conveniences, which can be bought on the installment plan on easy terms, and within the reach of wage-earners with moderate incomes, the company only wishing to secure a fair interest upon the money invested. The transportation facilities are excellent. There are three railroads running to the property, and within thirty-five minutes of the New York City Hall. The location is a healthy one. It has a natural drainage, while a sewage disposal plant designed by Colonel Waring is provided to carry out his system of purification of sewage by bacterial oxidation, which is in successful operation. The houses are models of architectural good taste and beauty, and a most successful effect has been produced by using a combination of brick, stucco, and half-timber work, the houses being somewhat similar to those in Shakespeare's native district. The houses are constructed in a most substantial manner of the best materials and workmanship, and they are also provided with the best modern plumbing, all exposed and of durable construction. The interiors of the houses have been designed with strictest economy of space, and the greatest care has been given

their planning. The architect, Mr. Percy Griffin, has given months of careful and special study to the problem of creating a suburb, where the houses, while pleasing architecturally, shall be solidly built with first-class material and appurtenances, and yet come within the resource of wage-earners. His efforts have evidently been crowned with success, owing to the fact that most of the houses already completed have been disposed of, and that there is still a demand for more houses of this character, which the company are now making arrangements to erect. The model cottage which we present as the subject for colors, and also on page 62, is one of a series which will appear at intervals in the Building Edition of the Scientific American. It is treated in the English half-timbered style, and it has a pleasant porch and numerous gable ends, which add quaintness to the whole building, producing an unusually attractive and pleasing effect. The underpinning and first story are built of red brick, while the second story is beamed, forming panels, which are filled in with rough plasterwork. The beams are stained a burnt umber, while the plasterwork is a natural gray color. The roof is covered with blue slate. Dimensions: Front, 21 ft. 2 in.; side, 27 ft. 10 in., not including porches. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in. The interior arrangement is most complete, and it has been designed with the strictest economy of space, and the greatest care has been given to its planning. The arrangement of kitchens, closets, and pantries is most convenient, and nearly all the rooms have windows on two sides to give perfect ventilation, the object being throughout to make the interiors, as well as the exteriors, as attractive as possible. The trim throughout is of cypress and pine, and the floors are of Georgia pine. The hall contains a neat ornamental staircase, with newels, posts, and balusters. The parlor and dining-room each have open fireplaces with brick facings and hearths, and neat wooden mantels. The kitchen is wainscoted, and contains dressers, closets, wash trays, and sink. The second floor contains four bedrooms and bathroom and six closets. The bathroom is fitted up in a neat manner, with a porcelain lined bath tub and the other usual fixtures, and exposed nickelplated plumbing. A cemented cellar contains a furnace and other necessary apartments. The cost of this house is $3,810, including a plot of ground 30 by 100 feet, macadamizing, sidewalks, sewering, gas, water, trees, and hedges in front. Mr. Percy Griffin, architect, No. 48 Exchange Place, New York, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A DOUBLE RESIDENCE AT SPRINGFIELD, MASS.

The engravings shown on page 73, in this issue, illustrate a double residence erected for the Forest Park Heights Land Company, at Springfield, Mass. The design is admirable for a building erected for two families, and, while each house contains a complete suite of rooms on each floor, the exterior lines are so changed by being well broken by numerous bay windows, balconies, a spacious and well-shaded piazza, that the exterior resembles that of a single residence. The building is treated in the gambrel roof order, with colonial detail. The underpinning is built of brick. The superstructure above is covered with clapboards, and painted colonial yellow, with white trimmings. The roof is covered with shingles, and left to weather finish. Dimensions: Front, 45 ft.; side, 53 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The plan is most excellently arranged, and it has been given much study by the architect. Each house, though planned differently, contains the full and equal number of apartments. The halls are trimmed with quartered oak, and are entered through a vestibule trimmed in a similar manner. These halls contain pleasant nooks and open fireplaces built of pressed brick, with hearths, facings, and mantels of same. The parlors and dining rooms are trimmed with whitewood, the former being treated with ivory white, while the latter are finished natural. The kitchens and its apartments are trimmed and wainscoted with North Carolina pine, and are furnished with the best modern fixtures. The second floor is trimmed with whitewood, and each house contains three bedrooms and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed plumbing. The third floor of each house contains three bedrooms. The floors are laid with the best rift hard pine throughout, with the exception of halls and dining-rooms, which have oak floors, and the kitchens, which have maple floors. The house has electric bells and electric gas lighting. The windows are glazed partly with plate glass, while the remainder is of heavy German glass. A cemented cellar under the whole building contains laundries, furnaces, and all the necessary apartments for each house. Messrs. Louis Frank Newman and Carroll H. Pratt, architects, 21 Elm Street, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A WINDOW IN AN OLD NUREMBERG DWELLING.

The window which we illustrate herewith, although built when the Rococo style was found almost everywhere, nevertheless presents many characteristics which redeem it from the eccentricity of the style of Louis Quatorze. Exaggerated in many respects though the ornamentation may be, the window is free from much of the extravagance and irregularity so characteristic of Rococo art. From the bracket below, to the vase-crowned window-cap above, the window is constructed with a symmetry foreign to many of the Baroque buildings of the time.

A WINDOW IN AN EIGHTEENTH CENTURY DWELLING IN NUREMBERG.

We are indebted to Blätter für Architektur und Kunsthandwerk for our illustration.

A MODERN FLAT HOUSE AT BRIDGEPORT, CONN.

We present on page 63 a modern flat house, which has been erected for S. A. Burnes, Esq., at Bridgeport, Conn. The design shown has many attractive features, including a separate entrance and porch for each family, both front and rear, bay windows, balconies, and gambrel roof. The underpinning is built of rock-faced bluestone. The exterior is covered with sheathing and paper. The first story is clapboarded, while the second story is covered with shingles: both are painted colonial yellow, with ivory white trimmings. The roofs are also shingled and are stained a dark red, while the remainder of the exterior is finished same as first and second stories. Dimensions: Front, 29 ft.; side, 48 ft. 9 in., not including porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 9 ft.; third, 8 ft. The building is arranged in the most complete manner for two families in flats, and is intended to meet the increasing demand on the part of those who desire to own their own house, but feel unable to bear the burden of expense entailed by a house from which there is no income. In houses of this class, one flat being rented brings in sufficient income to enable the owner to occupy the other flat "virtually rent free." Each flat contains a parlor, dining-room, kitchen, pantry, two bedrooms, and bathroom, besides an extra bedroom on third floor for each family. The parlors, dining-rooms, and bedrooms are trimmed with ash, while the kitchens, pantries, and rear halls are trimmed with North Carolina pine. The whole is finished natural. The parlors have bay windows and ornamental mantels and chimney breasts. The kitchens and pantries are wainscoted, and are fitted up complete. The bathrooms are wainscoted, and trimmed with North Carolina pine, and are fitted up with the usual fixtures and exposed plumbing. The house is supplied with hot and cold water, and is piped for gas. The house is heated by hot air, with a separate furnace for each flat in cellar. This cellar contains all the necessary apartments for each family. The third floor also contains ample storage room, besides the one bedroom provided for each family. The windows in front part of house are glazed with polished plate glass, except those in hallway, which are glazed with cathedral glass. The original cost was $3,800; this price covered the work complete, except chandeliers, but including sheet glass for windows and whitewood trim. Plate glass and hardwood were substituted afterwards, increasing the cost. Mr. Charles T. Beardsley, Jr., architect, Bridgeport Savings Bank Building, Bridgeport, Conn.

Our engravings were made direct from a photograph of the building, taken specially for the Scientific American.

THE CASTLE OF VINCIGLIATA.

The country around Florence is particularly interesting, and the valley of the Arno is one of the most beautiful spots in Italy. On a hill near Fiesole is the charming Castle of Vincigliata, which, thanks to its owner, an Englishman, Mr. John Temple-Leader, has been restored to the same condition in which it existed in feudal times. It is rarely that a castle can be seen which in any way approximates its condition in the Middle Ages, and it is all the more notable on this account. It stands very high on arid and rocky ground, and with battlemented fortress walls forms a prominent object in the landscape. The road from Florence rises steeply, with plantations of fir and cypress on either side until the very gate of the mediæval fortress is reached. The old castle dates from very early times, and has been mentioned by many Florentine historians. In early times it was either a baronial residence or was the home of some prelate of the church. The first record which we have of it dates from 1031, and in 1069 it passed to the family of Visdomini, then to the family of Buonacini, and finally passed to the famous family of the Albizzi.

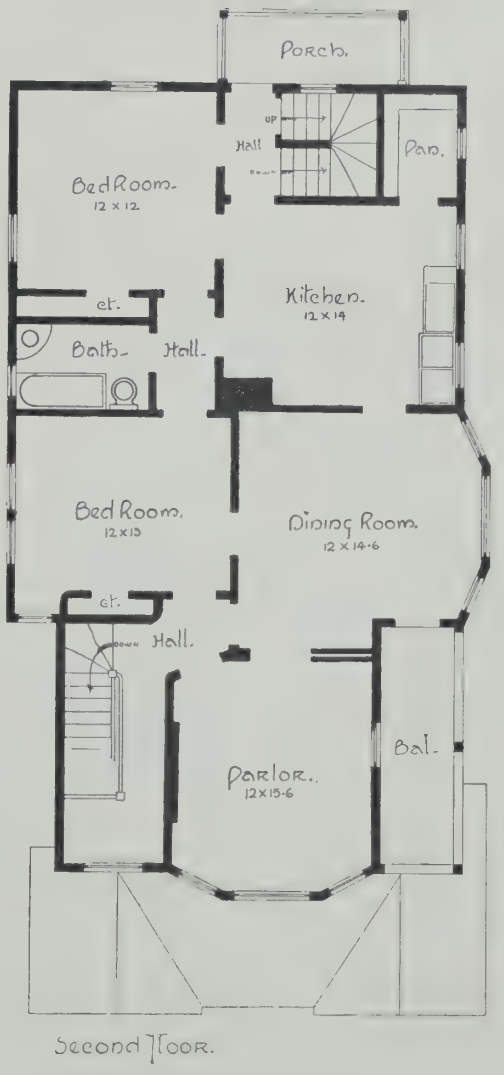
In 1827 it was purchased by Mr. Temple-Leader, who already had much land in the neighborhood, and he restored it from a state of complete ruin to its present condition. To do this properly, demanded the study of the old records and ancient edifices, and it may truly be said that Vincigliata is in no sense an imitation, but Vincigliata as it actually existed in the olden days when opposed to the repeated assaults of foreign foes and hostile neighbors. It is now a real museum of the Middle Ages. Great researches were made, and old plans were brought to light, and the work was done by a young architect named Fancelli, who studied all the ruins of like nature in the province. In addition to being a fortress with frowning towers and battlements, it was also adapted for gentler uses, and it was famous in the annals of Florence.

The débris was first cleared away by Fancelli, and the outer circle of the walls was rebuilt, which was followed by the rebuilding and repairing of all of the walls and inner rooms. The work was done so successfully that everything looks as though it had been transmitted unchanged through a long line of feudal chiefs. The minutest details were attended to, and even the frescoes on the walls are the same as those which formerly existed. Every piece of furniture in the group of buildings was carefully selected, and even the kitchen utensils are veritable antiques or modern facsimiles of the best examples. From the massive watch tower in the centre

(Continued on page 75.)

A MODEL COTTAGE AT HOMEWOOD, BOROUGH OF BROOKLYN, N. Y.—See page 60.

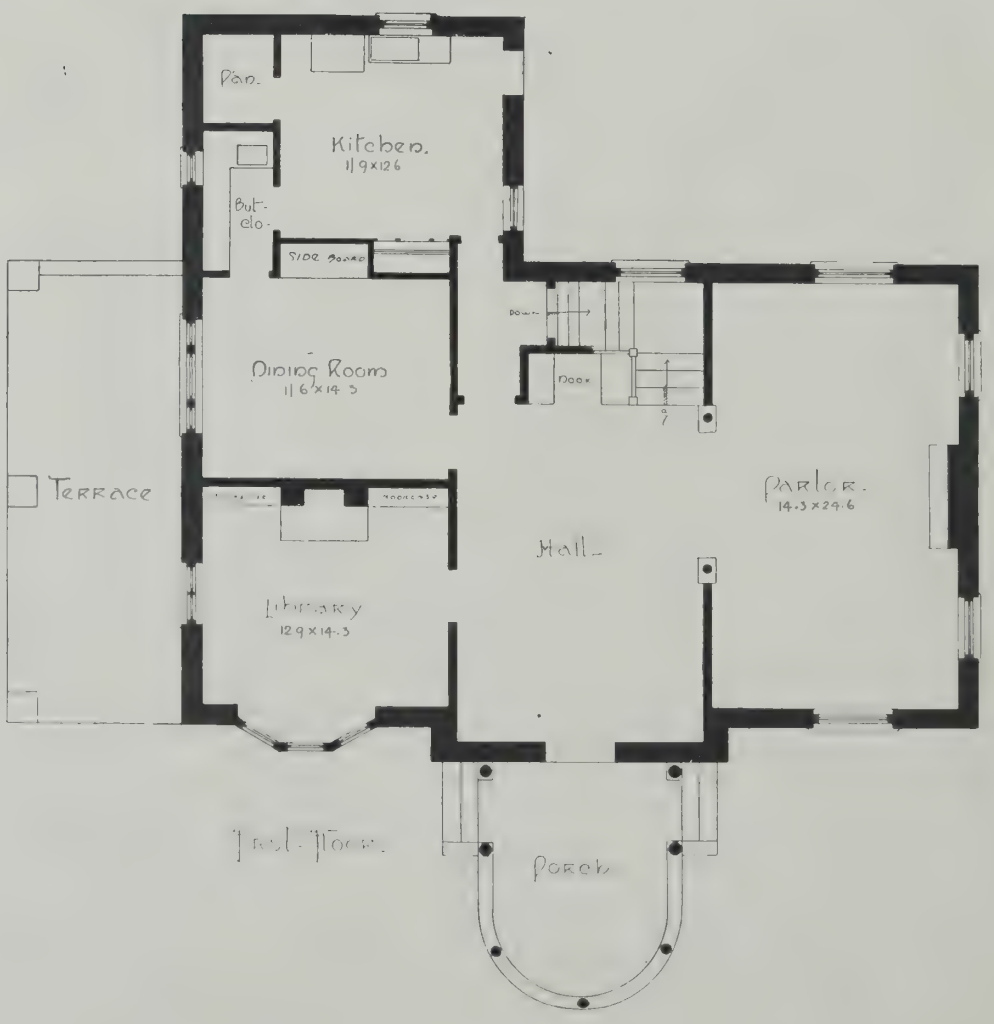
MR. PERCY GRIFFIN, ARCHITECT.



BOSTON PUBLIC LIBRARY

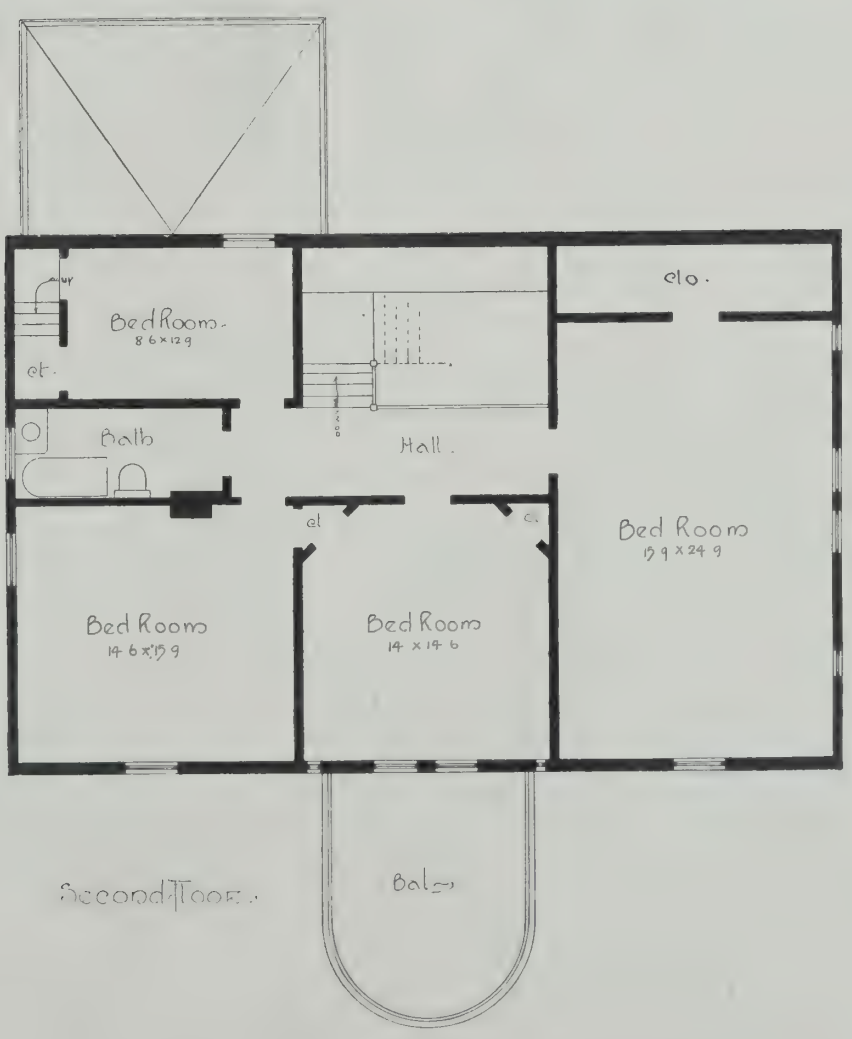
A MODERN FLAT HOUSE AT BRIDGEPORT, CONN.—See page 61.

MR. CHARLES T. BEARDSLEY, JR., ARCHITECT.



A RESIDENCE AT YONKERS, N. Y.—See page 60.

MR. G. G. LAURYENS, ARCHITECT.

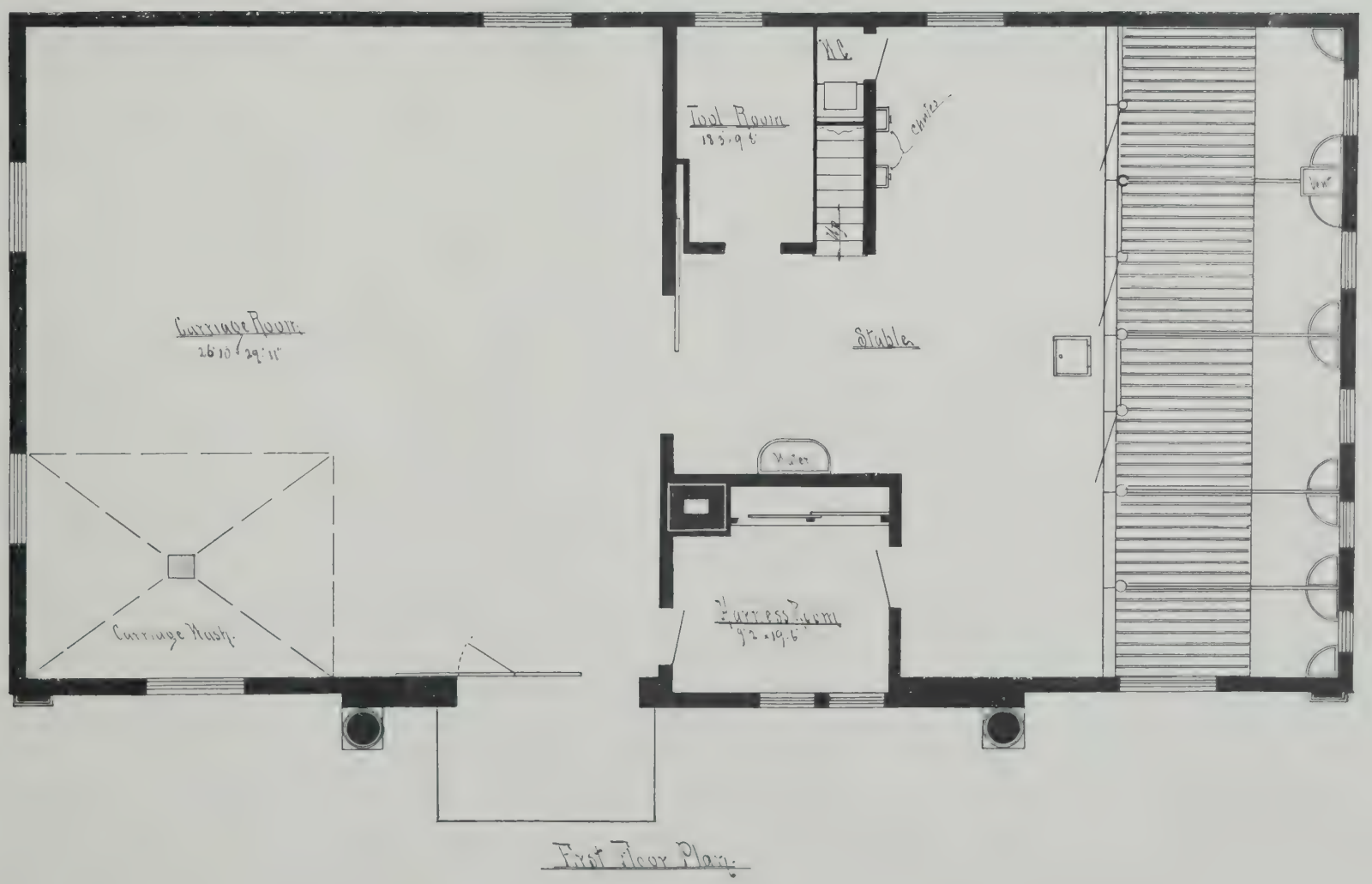


A RESIDENCE AT YONKERS, N. Y.—See page 60.

MR. G. G. LAURYENS, ARCHITECT.

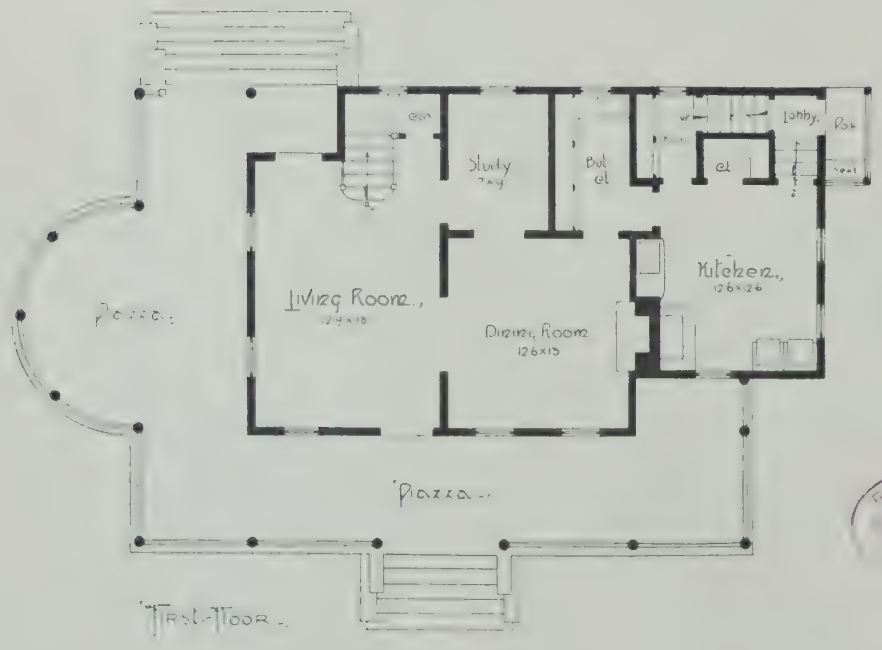
A RESIDENCE AT SPRINGFIELD, MASS.—See page 75.

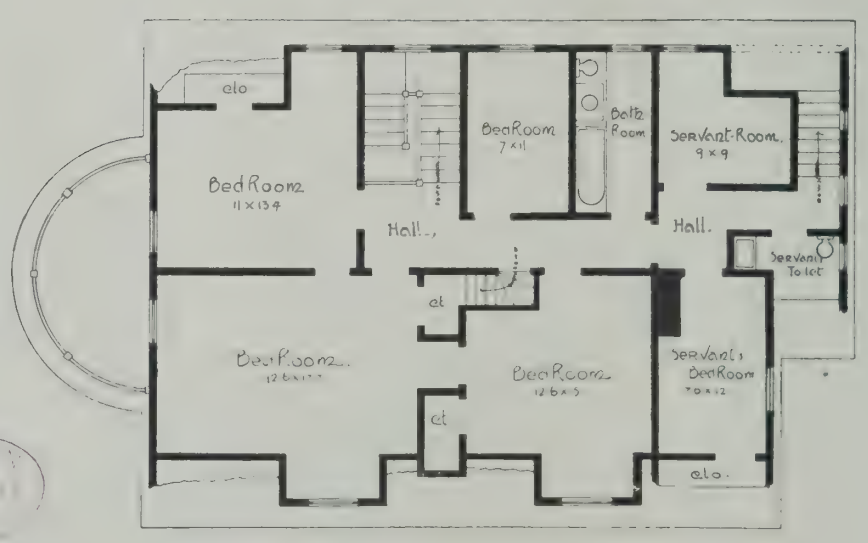
MESSRS. CLOUGH & REID, ARCHITECTS.



A STABLE AT SPRINGFIELD, MASS.—See page 75.

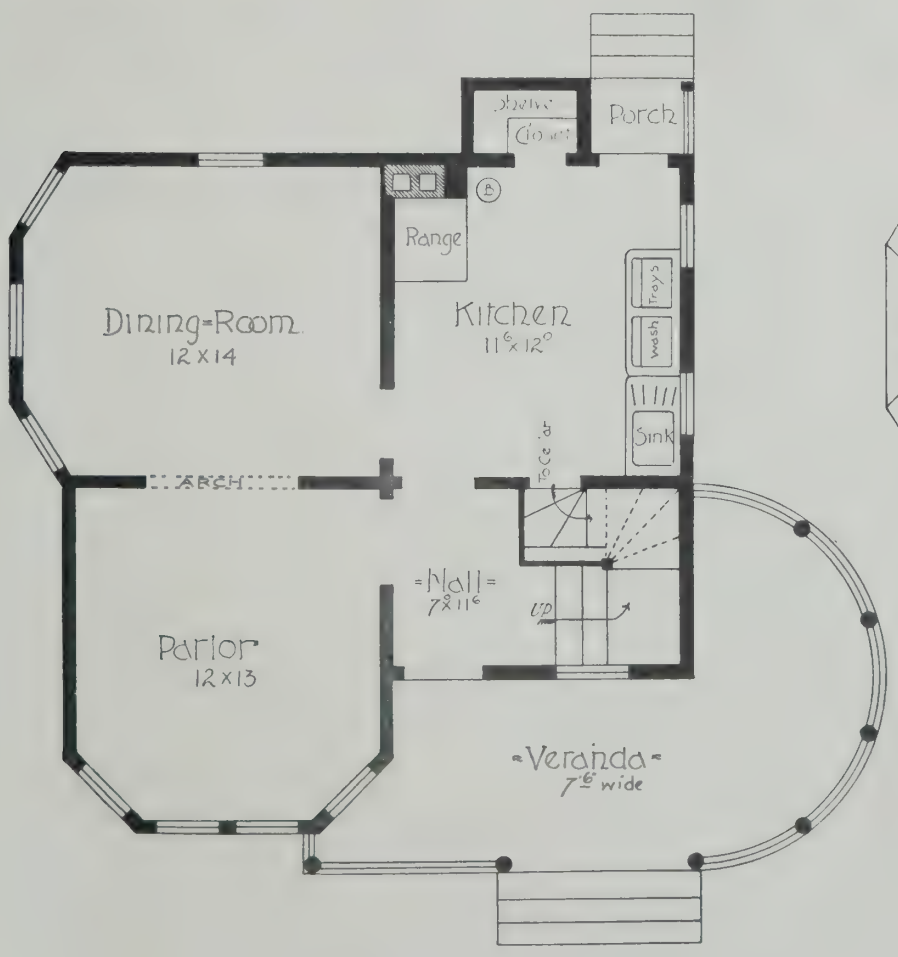
MESSRS. CLOUGH & REID, ARCHITECTS.





A SUMMER COTTAGE AT SEA GATE, LONG ISLAND.—See page 75.

MESSRS. PARFITT BROTHERS, ARCHITECTS.



First-Floor-Plan

Second-Floor-Plan

A COTTAGE AT ROCHELLE PARK, N. J.—See page 75.

MR. W. A. LAMBERT, ARCHITECT.

A RESIDENCE AT LARCHMONT, N. Y.—See page 75.

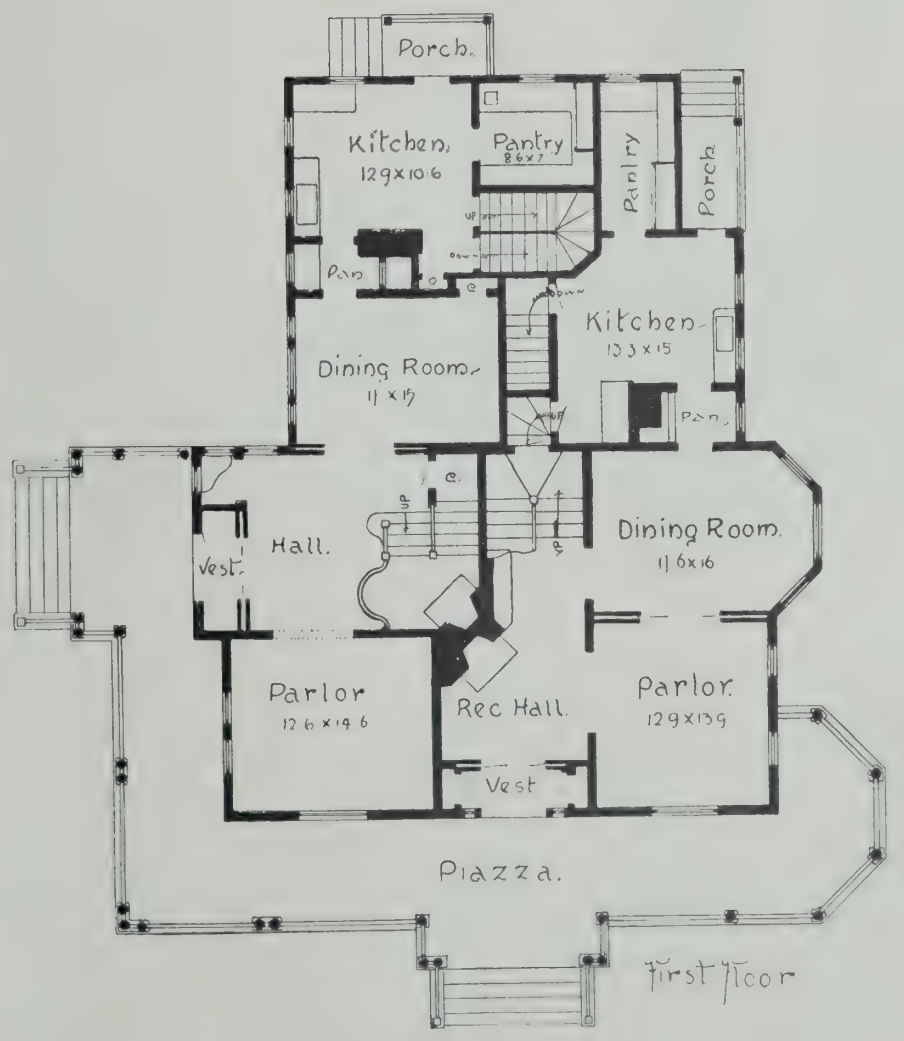
MR. FRANK A. MOORE, ARCHITECT.

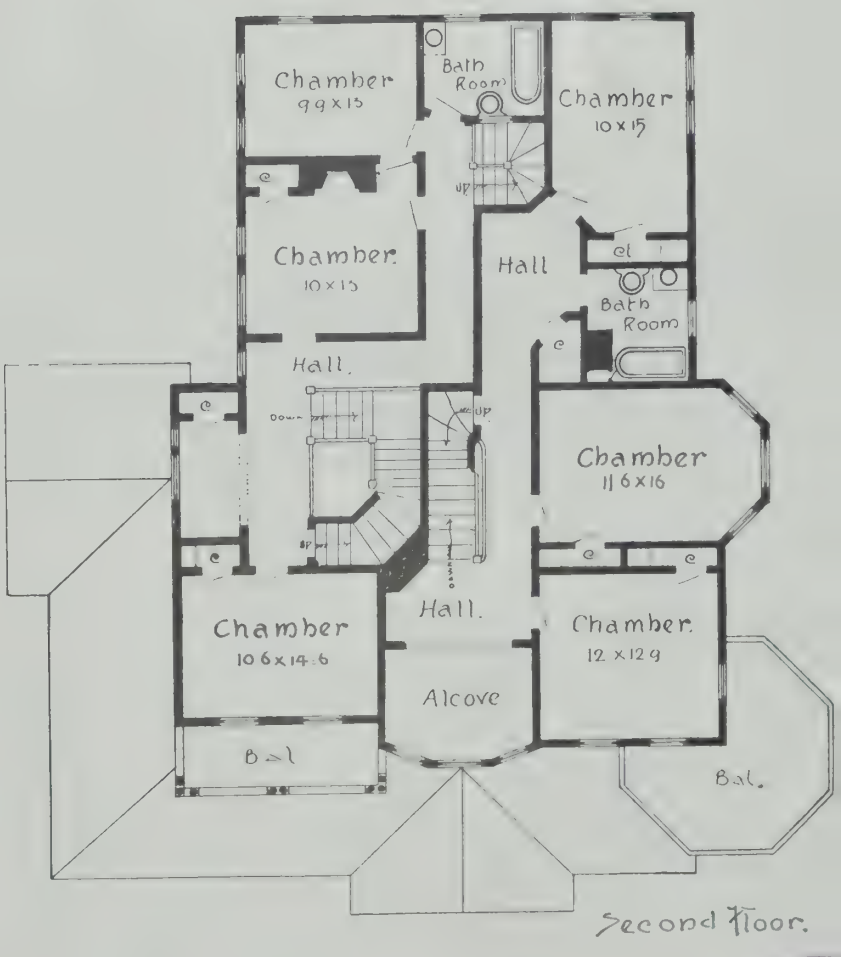
A RESIDENCE AT LARCHMONT, N. Y.—See page 75.

MR. FRANK A. MOORE, ARCHITECT.

A RESIDENCE AT SALISBURY, MD.—See page 75.

MR. THOMAS H. MITCHELL, ARCHITECT.





A DOUBLE RESIDENCE AT SPRINGFIELD, MASS.—See page 61.

MESSRS. LOUIS F. NEWMAN AND CARROLL H. PRATT, ARCHITECTS.

THE ENTRANCE.

THE ARMORY.

GENERAL VIEW OF THE CASTLE.

THE KITCHEN.

THE CASTLE OF VINCIGLIATA, NEAR FLORENCE, ITALY.—See page 61.

THE CASTLE OF VINCIGLIATA.

(Continued from page 61.)

the old warders of the castle could easily distinguish the approach of enemies along the hills, and could give timely warning to the men-at-arms below. The outer works of the castle within the outer massive wall form a vineyard and rough garden. The courtyard of the castle has on one side a pillared loggia, and it is decorated with coats of arms, with shields, and a variety of objects in alto-rilievo, Robbia ware, and marble. The well at one angle of the courtyard is very handsome, and furnishes an excellent supply of water, the depth being 240 feet. The armory opens into this courtyard, and it is shown in our engraving. Here are pikes, halberds, scythes, as well as complete suits of armor. To the left is a small chapel, containing a famous Annunciation in Robbia ware. To the right of the armory is the council chamber, on the walls of which are some frescoes which date from 1498. The great hall leads to large, narrow rooms with vaulted ceilings, and the kitchen is furnished with great cupboards, brass urns, pans, lanterns, etc., and so perfect is this room that we can call up a mental picture of the cooks of the Middle Ages roasting their enormous joints of meat on huge spits. A splendid view is obtained from a tower, which is 873 feet above the level of the sea. Several views of the castle are given on page 74.

Probably the most famous encounter which the grim walls ever had with an invader was when Sir John Hawkwood made a raid from Pisa and the castle was battered by his English followers. Nothing is more interesting in the early history of the Italian cities than the condottieri, of which Sir John Hawkwood is possibly the best example. These mercenary leaders were really pirates of the land, and they enforced their demands against the foes of their employers, or turned their arms against their employers, at will. Mr. John Temple-Leader has written an interesting monograph on this condottiere, which is another contribution made to the world by this unselfish and generous Englishman.

A RESIDENCE AT LARCHMONT, N. Y.

The engravings shown on pages 70 and 71 in this issue illustrate a residence recently erected for E. F. Beddall, Esq., at Larchmont, N. Y. The building is treated in an excellent style of architecture, and it contains many unique and pleasing features. The underpinning is built of granite of a grayish blue color. The first story and part of second and third stories are covered with shingles finished natural, while the trimmings are painted bottle green; the remainder of the second and third stories is beamed, with the spaces filled in with cement plaster and tinted a grayish white color. The roof is shingled and finished natural. Dimensions: Front, 31 ft. 6 in.; side, 60 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The hall is treated in an unique manner, and the staircase hall is separated by a broad archway. The hall is trimmed with white mahogany. It has an ornamental staircase turned out of mahogany, with a paneled seat at side. This hall also contains an open fireplace, with tiled hearth and facings, and mantel with columns. A lavatory is conveniently located beneath staircase. The parlor is trimmed with white mahogany in a handsome manner. It contains a corner fireplace, with tiled hearth and facings, and mantel. The dining-room is trimmed with oak, and it has a paneled wainscoting, wood cornice, nook for buffet, and an open fireplace, fitted up with a tiled hearth and facings, and mantel. It also has a hardwood floor. The kitchen and its apartments are most complete, are furnished with all the best modern fixtures, and is trimmed and wainscoted with North Carolina pine. The butler's pantry is well fitted up with cupboards, dressers, bowl, etc. The rear hall and stairway are conveniently located. The second floor is trimmed with whitewood, part of which is painted, while the remainder is finished natural. This floor contains four bedrooms and two bathrooms; the latter are wainscoted, and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and ample storage. A cemented cellar contains furnace, laundry, servants' bath, and other necessary apartments. Cost, $10,000 complete. Mr. Frank A. Moore, architect, No. 123 East Twenty-third Street, New York City, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A RESIDENCE AT SPRINGFIELD, MASS.

The engravings shown on page 66 illustrate a residence which has been recently completed for Henry J. Beebe, Esq., at Springfield, Mass. The design is treated in a most admirable manner, is of the classic colonial style of architecture, with massive Corinthian columns at side piazza rising up two stories. The front entrance porch is one of the principal features of the exterior, with its exquisitely designed columns, fluted and finished with carved capitals. The underpinning is constructed of rock-faced granite. The building above, of wood, is covered with sheathing on the exterior, and then clapboards, and painted colonial yellow, with ivory white trimmings. The roof is covered with shingles and finished natural. Dimensions: Front, 54 ft.; side, 77 ft. 9 in., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 11 ft.; second, 10 ft.; third, 9 ft. The interior is trimmed and finished off in an elegant manner with rare carvings and hardwood trim and ornamental fixtures. The vestibule is trimmed and paneled with mahogany, and the floor is paved with tiles laid in mosaic. The main hall is trimmed with white mahogany, and it has a paneled wainscoting to the height of six feet, and a timbered ceiling. The staircase is a very grand one, with massive carved newel posts, balusters, and rail. The fireplace is built of brick, and it has tiled facings and hearth and a massive carved mantel. The side entrance from porte-cochère, with vestibule, coat closet, and toilet, is a convenience. The parlor is treated in the Louis XVI. style, in white and gold. It has an open fireplace, with Mexican onyx trimmings, and a mantel of excellent design. The library is a handsome apartment. It is trimmed with oak treated in the Flemish style, and it has a paneled wainscoting, a beamed ceiling, bookcases built in, and a fireplace, furnished with tiled facings and hearth, and mantel. The music-room is trimmed with whitewood, tinted, and it has a swell bay window at side and an open fireplace. The den is trimmed with oak, and is provided with a beamed ceiling, paneled wainscoting, and an open fireplace. The side hall contains an ornamental staircase turned out of ash. The dining-room is treated in an elegant manner. It is trimmed with Mexican mahogany, with paneled wainscot and massive beamed ceiling, and it contains a buffet built in and a grand open fireplace, with massive carved mantel and tiled trimmings. The butler's pantry is well fitted up with drawers, dressers, cupboards, and bowl. The kitchen, laundry, and its dependencies are furnished with the best modern conveniences. The second floor is trimmed and finished off in a handsome manner, and it contains a morning room, three bedrooms, dressing-room, large closets, and two bathrooms, besides linen closet and two servants' bedrooms and bathroom, which are isolated from the main house and provided with a private stairway. The bathrooms are paved with unglazed tiles and wainscoted with white enamel tiles, and furnished with porcelain fixtures and exposed nickelplated plumbing. The fireplaces where shown are trimmed with tiled facings and hearth and mantels. The third floor contains a suite of apartments and extra guest-rooms, besides ample storage room. A cemented cellar contains furnace and other necessary apartments. Messrs. Clough & Reid, architects, 280 High Street, Holyoke, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A STABLE AT SPRINGFIELD, MASS.

The engravings shown on page 67 illustrate a stable which has been erected for Henry J. Beebe, Esq., at Springfield, Mass. The design is most unique, and is treated in the colonial style, and in keeping with the residence of Mr. Beebe in every particular, which we also present in this issue. The columns at either side of entrance add much to the exterior effect. The underpinning is built of brick, laid in red mortar, with rock-faced granite trimmings. The building above is sheathed on the exterior, and then clapboarded and painted a colonial yellow, with ivory white trimmings The gables are shingled and treated with a similar color. The roof is shingled and finished natural. Dimensions: Front, 59 ft.; side, 29 ft. 9 in. The interior arrangement is most complete. The walls, ceilings, and all partitions are ceiled up with yellow pine, and finished with hard oil. The carriage room, of large dimensions, is provided with a carriage wash. The harness room contains the cupboards, with sliding glass doors, and the usual iron fixtures. The stable contains two single stalls and three box stalls, all fitted up with the usual ornamental iron trimmings and fixtures. The second floor contains the man's rooms, and ample room for hay, feed, etc. Messrs. Clough & Reid, architects, 280 High Street, Holyoke, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A RESIDENCE AT SALISBURY, MD.

The engravings shown on page 72, in this issue, illustrate a residence which has been erected for Thomas H. Mitchell, Esq., at Salisbury, Md. The design presents a house of modern treatment, with good features and excellent detail. The spacious piazza, porte-cochère, conservatory, balconies, and tower are some of the features. The underpinning and all brick work where shown are built of red brick, laid up in red mortar. The exterior above, of wood, is covered with sheathing paper and novelty siding, which are mitred at corners with a special corner, being turned with a lathe to correspond with the siding. The whole is painted white. The roof is covered with a Peach Bottom slate. Dimensions: Front, 40 ft.; side, 44 ft., not including piazza and porch. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft. 6 in.; third, 8 ft. The entrance is through a vestibule, with a tiled wainscoting and a tiled floor. The main hall is trimmed with oak. It has a paneled wainscoting, and the whole is stained antique oak. This wainscot runs up the stairway and around upper hall. The staircase is an ornamental one, with carved newel posts, seat at side, and an archway over same. The parlor is trimmed with mahogany, and it contains an open fireplace, with tiled facings and hearth, and a mahogany mantel, and it also has a corner bay with seat. The library and dining-room are separated by double sliding doors, and each is trimmed with oak; the former has an open fireplace, furnished with tiled trimmings and an oak mantel, while the latter has a paneled wainscoting. The conservatory opens into each room. The butler's pantry and kitchen, and its dependencies, are trimmed and wainscoted with North Carolina pine, and are fitted up with the best modern fixtures complete. The second floor contains four bedrooms, one finished in walnut, one in cherry, and one in California redwood, with open fireplace and tile trimmings, and one in yellow pine. The bathroom has a vitrified tiled floor and a tile wainscoting. It is furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains the servant's quarters, store-room, etc. A cemented cellar contains a hot-water heater, laundry, and all necessary rooms. Cost, $4,200 complete. Mr. Thomas H. Mitchell, architect, Salisbury, Md.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A SUMMER COTTAGE AT SEA GATE, LONG ISLAND.

The engravings on page 68, in this issue, show a summer cottage which has been erected recently for Calvin Tomkins, Esq., at Sea Gate, Long Island. The design is attractive for a gambrel roof cottage, and it has an attractive piazza and a good roof, well broken by dormer windows. The building rests upon locust posts. There is a cellar under the whole house. The walls are formed of locust posts, with sheathing nailed on the outside of posts. This cellar bottom is cemented, and it contains bath boxes, bicycle room, and ample storage. The exterior, from grade to peak, is sheathed and then shingled throughout and left to weather finish. The trimmings are painted cream white; the blinds, bottle-green. Dimensions: Front, 40 ft.; side, 24 ft., exclusive of piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The interior throughout is trimmed with yellow pine, finished natural with hard oil. There are two entrances to the living room, which is finished off in a neat manner. This room contains an ornamental staircase, with coat closet under same. The study is a unique little room, with divan and bookcases. The dining-room is a pleasant apartment. It has a fireplace recessed six inches, with the hearth and facings to ceiling of Tiffany brick, and mantel of wood. The kitchen and pantries are fitted up with the best modern conveniences. The second floor contains four bedrooms, two servants' bedrooms, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed plumbing. The third floor contains ample storage room. Cost, $4,785 complete. Messrs Parfitt Bros., architects, No. 26 Court Street, Brooklyn, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A COTTAGE AT ROCHELLE PARK, N. J.

We present on page 69 a cottage which has been erected at Rochelle Park, N. J. In designing this building it was the aim to make it convenient, economical, and artistic, suitable for a suburban home for a family of moderate means, and at the same time attractive and pleasing. The underpinning is built of brick. The first story and part of second story are clapboarded, while the belt course, gables, and roofs are shingles. Dimensions: Front, 27 ft.; side, 30 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft.; third, 7 ft. 6 in. The interior throughout is trimmed with North Carolina pine, finished natural. The hall contains an ornamental staircase turned out of ash, and is lighted by a small window, glazed with delicately tinted glass. The parlor and dining-room are separated by a portière opening. The parlor has a hardwood mantel, with beveled plate mirror, and it has a bay window the entire width of room. The kitchen is fitted up with sink, wash trays, range, pantry, etc., complete. The second floor contains four bedrooms and bathroom, the latter being wainscoted and furnished with the usual fixtures and exposed plumbing. The third floor contains ample space for several rooms and storage. The floors throughout are laid with yellow pine in narrow widths. The house is heated throughout with a hot air furnace, which is located in a cemented cellar. The entire building is sheathed with hemlock boards and paper, and is built in a thorough manner. Cost, $2,000 complete. Mr. W. A. Lambert, architect, 99 Nassau Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

Hollow Block Building vs. Frame.

BY M. W. LAUER.

THE speculative builder who builds to sell has but one object in view, and that is to build at the lowest possible cost such a building as will favorably impress the prospective buyer long enough to induce him to buy it from the builder. There is no other material in this market from which the builder can obtain such a great variety of effect for an equal expenditure as he can from lumber. He can build in any style of architecture, from the primitive hunter's cabin to the most modern creation of the architect's mind. He can have a radius or angle or bay, a radius or angle tower, or any other embellishment he may choose, and can trim the building in keeping with his design, be it a castellated effect, with buttress walls or Irish renaissance, meaning a combination of all styles of architecture, à la Irish stew. He can have his lumber cut so that it will fit properly, and when he has finished, while he has only built a frame structure, we must admit that when built after a good plan it looks well. He sells it and immediately starts in to repeat the operation. He cares not if after a short time the owner discovers that his home is not what he thought it was; he cares not if the owner discovers that the lumber used was of an inferior quality, that one nail is doing the service of two, that paper sheathing was not put in at all, that the paint is crumbling off, and that, should a fire ever reach the studding it would spread all over the building and destroy it before he could summon assistance in putting it out. The builder cares not a straw if the owner, fortunate enough, perhaps, to escape a destructive fire, finds his home is just as surely being destroyed by the weather, and that he must continually spend money for repairs if he would keep his home in good condition, making the building more costly each year. However, the owner who finds that the cold winds of winter are readily conducted through the frame sides and from the basement up through the floors, necessitating the putting of his hand down deep in his pocket for dollars for which to buy fuel if he would keep himself comfortable during the winter months; the owner who finds on entering his basement some frosty winter morning that the season's supply of vegetables has been destroyed by frost, that the water supply pipes contain a first-class brand of ice instead of water (inviting plumber's services, a costly luxury in the city), in short, that Jack Frost has taken possession until Old Sol comes back and displaces him during the summer months; the owner who finds that he is living in a house where he must freeze in winter and swelter during the hot days of summer, whose health and happiness is affected in a measure by the kind of a house he lives in—does care for all these things. The verdict of those for whom we have built hollow block houses is, that the objections laid at the door of frame structures are entirely overcome by the use of hollow blocks, and that, although the first cost of a hollow block house is greater than that of frame, it is cheaper in the end, because "the best is always the cheapest."

The objections urged against a frame building, briefly stated, are these:

First. The very nature of frame construction affords ample opportunity for the substitution of inferior grades of lumber where only the best should be used. Green lumber is often used which warps and twists in the building when it becomes dry.

Second. The framing or roughing in is slapped together in a hurried manner, because after the siding is put on no one will know whether it has been done properly or not.

Third. A frame building is a good conductor of heat and cold, and as such transmits to the interior the heat of summer and the cold of winter.

Fourth. The combustible nature of a frame building, and ease with which a fire spreads (unless "nipped in the bud"), increases the cost of insurance.

Fifth. The necessity of repainting and repairing in order to preserve its life and retain its appearance.

Numerous other objections might be brought up, but those just mentioned will suffice. A hollow block building will overcome all of those objections for the following reasons:

First. The hollow blocks which the writer has seen, and those which he has used in the construction of buildings, have been burned to a degree of hardness making them impervious to moisture and unaffected by weather. It requires no expert to detect a poor block if laid in the wall. Building blocks, when properly laid, will remain so a lifetime.

Second. Building blocks can be well laid, and yet laid rapidly, so that there is little to be gained by unduly rushing or slighting the work. It is impossible in the construction of a hollow block building to successfully hide either defective material or cheap and poor workmanship. In order to obtain a good appearance it is not only essential to use good blocks, but to have them well and carefully laid. The writer has seen good blocks laid up in such a manner as to disgust a prospective builder and lead him to believe that it was the fault of the blocks that produced the abominable effect presented.

Third. Practical tests have demonstrated that there is no better non-conductor of heat and cold than dead air. The walls of a hollow block building contain dead air or non-circulating air, preventing the transmission of heat or cold through the same. The writer has a number of testimonials dwelling upon the fact that basements and houses built of hollow blocks are cool in summer and warm in winter.

Fourth. There is no necessity for a comparison as to the fireproof qualities of hollow building blocks and frame, as hollow building blocks are indestructible by fire. The rate of insurance is much less for a hollow block house than it is for frame, being rated the same as a brick or stone dwelling.

Fifth. A hollow building block, impervious to moisture, does not absorb and hold the dirt and dust from the air; dust does sometimes settle on the face of the blocks, but it is washed off by the first shower that comes along, making a building of this material look as fresh and new as though it had just received the finishing touches of a tuck-pointer.—Brick.

Normal Building Sand.

AN important feature in connection with the use of mortars and cements in masonry structure is the nature of the sand used in the mixture; yet in nearly all tests the cement is the main object under consideration, the sand being often rather neglected. It is this fact which gives especial interest and value to the tests, of so-called normal sands selected from various countries, recently conducted by Herr M. Gary at the Berlin Testing Laboratory. From the Mitt. aus den Kgl. Technischen Versuchsanstalten, in which the full report appeared, the following abstract of the work is given. It is well that attention has been directed to so fundamental an element in building construction.

Ten different varieties of sand were tested, and, in order that there might be no doubt as to the high quality and character of the samples, care was taken to have them selected by experts of acknowledged reputation in the various countries from which they were obtained.

Two varieties from Germany were tested, one being a crushed quartz from Freienwalde in Prussia, and the other the sand obtained from the Rhine by dredging. Single samples of standard sand were obtained from Austria, Switzerland, Russia, Norway, England, and the United States, and two samples from France, one of these being from Leucate, a natural sand brought down by the mountain streams of the Pyrenees, and the other a crushed quartz from Cherbourg.

The tests of the ten varieties of sand consisted in a chemical analysis, and a measurement of the loss of weight at red heat, as well as a determination of specific gravity, and size of grains, after which briquettes were made with Portland cement, and subjected to tension tests after seven, twenty-eight, and ninety days' hardening under water. Two sets of briquettes were made with each kind of sand, one set containing one part by weight of cement to three of sand, and the other one part of cement to five of sand. The former proportion represents the usual practice in nearly all countries; the latter was used to the extent to which the addition of a greater proportion of sand affects the strength. Very interesting microphotographs were made of the samples of sand, and the difference in the character of the grains was in some cases very marked.

It is impossible to go into the details of these interesting tests, which are fully tabulated and illustrated with diagrams in the original report, but some of the conclusions are here given.

Among other points it was found that the very sharp crushed quartz sand, which under the microscope showed an angular structure, gave a high tension test and a low compression test, while the natural sands, with rather rounded grains, gave proportionally better results in compression. Thus for the American sand, a crushed quartz from Massachusetts, the ratio between the tension and compression tests was 1 : 5.7, while for the English sand, which under the microscope showed round smooth grains, the ratio was 1 : 10.

The resistance to tension for the mixture of three of sand to one of cement was, for the English and American sands, respectively 424 pounds and 451 pounds per square inch, while for compression the figures were 4,300 pounds and 2,560 pounds. The American sand stood among the highest in the tension tests, being equaled only by that from Switzerland, but in the compression tests it was much lower than any other, the next higher being 3,500 pounds per square inch. On the other hand, the only sand which equaled the English sample in compression was that dredged from the Rhine, which also showed a similar rounded granular constitution. This feature is one which is worthy of further investigation, as, if it is possible to obtain high tension tests for a cement by the use of a sharp sand, while at the same time its resistance, when applied in practice with similar sand under compression, is diminished, these facts should be taken into consideration, or else, more properly, both tension and compression tests should be required.

Tests made with mixtures of sands of coarse and fine grains showed inferior results to those obtained with sands uniform in size of grain.

In concluding his report, Herr Gary recognizes the fact that the tests, being made with but one kind of cement, and with a limited number of samples of sand, can be considered as giving only general indications of the behavior of the materials. Many additional tests must be made before positive conclusions can be drawn. The results, however, certainly emphasize the importance of taking into account the nature of the sand in connection with tests and users of mortars and cements, and, if such tests are continued, they may lead to the establishment of an international standard.—Engineering Magazine.

Mahogany and Veneers.

THE large exports of electrical and other machinery to South America have been the means of fostering an import trade in mahogany wood that affects the furniture and cabinet business in all parts of the country. Most of the steamers that return from the South stop at Nicaragua and the United States of Colombia to load up with mahogany and cedar, two woods that are in constant demand in this country. Last year over 6,000,000 feet of mahogany logs was brought to this port, and the coming year the imports will probably run much higher.

Our increased trade with the South American countries must naturally stimulate these imports, for the rare hard woods of the tropical forest do not enter into competition with any native product. Their use is extending into many new fields and uses never before dreamed of. The perfection of the veneering machinery, by which very thin slices of the wood can be cut off at half the former prices, enables cabinet and furniture manufacturers to turn out loads of mahoganized articles. These furniture articles are what the trade calls "built-up" furniture. That is, they have a core of white pine or other cheap wood, and the surface is then veneered with thin layers of mahogany.

Before the veneering machinery was invented, all veneers were handsawed, and they cost considerable; but to-day 75 per cent. of the veneers is cut or sliced by huge knives. The sawed veneers are much better than the cut, and they last longer, but for the cheaper trade the cut answers all purposes. The slicer, as the veneer-cutting machine is called, is a costly machine, but it performs its work with wonderful effects. A large mahogany log is put into the powerful grip of the slicer, and as it moves against a rigid knife, which is 17 feet long, the veneer is cut off as evenly as a shaving is sliced from a block of wood by a plane. The whole log is thus sliced up into veneers one-thirtieth of an inch thick. Thus one log may yield several hundred veneers. Sawed veneers are more expensive, because not more than ten to fifteen can be cut from an inch of wood. The rest of the wood is lost in sawdust, while in the cut veneers there is no waste at all.

The relative cheapness of mahogany logs is also making revolutions in furniture manufacturing, says the New York Times. The sailing vessels and steamers engaged in the trade are more numerous than ever before, and each steamer may bring 700,000 feet of mahogany logs to New York, and the sailing vessels from 200,000 to 300,000 feet. The mahogany forests of South America are not being ruthlessly destroyed, as are many of our American woods. In Central America, where the forests are controlled by Americans, two trees are planted for every one cut. This wise policy insures a permanency of supply that practically makes the wood inexhaustible. The trees cut for this mahogany trade average twenty-five inches in diameter, with some running as large as forty inches. They vary in age from twenty-five to seventy-five years. In twenty-five years, it is estimated by those controlling the forests, a mahogany tree will attain a good commercial age, when it can be cut with profit to those planting it. As most of the logs are used for veneering purposes, their size does not count as much as it does with many of our native woods.

Natural Method of Testing Building Stone.

THE natural methods should always take precedence whenever they can be employed, because, says Baker, "First, the exact agencies concerned in the atmospheric attack upon stone, and, second, long periods of time far beyond the reach of artificial experiment."

One method is to visit the quarry, and observe whether the ledges that have been exposed to the weather are deeply corroded, or whether these old surfaces are still fresh. In applying this test, consideration must be given to the modifying effect of geological phenomena. It has been pointed out "that the length of time the ledges have been exposed, and the changes of actions to which they may have been subjected during long geological periods, are unknown; and since different quarries may not have been exposed to the same action, they do not always afford definite data for reliable comparative estimates of durability, except when different specimens occur in the same quarry."

North of the glacial limit, all the products of decomposition have been planed away and deposited as drift formation over the length and breadth of the land. The rocks are, therefore, in general, quite fresh in appearance, and possess only a slight depth of cap or worthless

rock. The same classes of rock, however, in the South, are covered with rotten products from long ages of atmospheric action.

A study of the surfaces of old buildings, bridge piers, monuments, tombstones, etc., which have been exposed to atmospheric influences for years, is one of the best sources of reliable information concerning the durability of stone. A durable stone will retain the tool marks made in working it, and preserve its edges and crevices sharp and true. Stones in Egypt, known to have been quarried 6,000 years, show tool marks as clear and perfect to-day as when first wrought. Of course, in these cases, much was due to the climate.—The National Builder.

Useful Items for Builders, Plasterers, Painters, Paperhangers, etc.

1. A GLUE or putty for cementing water tanks that are not zinc-lined is composed as follows: Melt 9 ounces guttapercha, and when melted stir in 25 ounces pumice-stone powder, and then add 50 ounces Burgundy pitch. Lay this compound (hot) on the inside of the tank, and pass a heated iron over its surface to smooth it. The tank may be filled with acids instead of water, but the weed of it will not be affected by same.

2. Another compound for a similar purpose is prepared by melting together equal parts (by weight) of pitch, rosin, and dried plaster of paris.

3. A colorless cement for plastering up cracks in structures exposed to the fumes of acids is prepared by mixing silicate of soda with powdered glass to form a stiff paste, and using this paste as a cement.

4. An acid-proof cement is also prepared by mixing either china clay with boiled linseed oil, or quicklime with raw linseed oil, or pipe clay and coal tar may be used.

5. To resist boiling acids, prepare a compound of India rubber, tallow, dry slaked lime, and red lead, as follows: Melt a sufficient quantity of India rubber over a sand bath, and then add 6 to 8 per cent. of its weight of tallow, and mix well in this ingredient by stirring the whole; then add sufficient dry slaked lime in powder to bring the mass to the consistency of soft paste. Finally, mix in 20 per cent. of red lead to make the compound harden and dry.

6. Another water-proofing cement and plaster is prepared by melting separately 50 parts of sulphur, 1 part of tallow, and 1 part of rosin, and mixing the three ingredients while hot, and then adding sufficient ground glass to make a stiff compound.

7. Cement and plaster to resist fumes of nitric and hydrochloric acid is prepared by melting and mixing equal parts of rosin and sulphur, and then stirring in brick-dust equal to carry the weight of the compound, or all three components may be mixed in the dry state, and the compound then heated and stirred.

8. A plaster cement that will soften without melting so as to adapt itself to the expansion and contraction of metal is prepared by dissolving 1 part of pure rubber in 2 parts of linseed oil, and then stirring in 6 parts of pipe clay.

9. A similar cement for an identical purpose is obtained by melting 24 parts of rosin, and, while this is hot, stirring in 4 parts of dry red ochre, 2 parts of calcined plaster of paris, and 3 parts of linseed oil.

10. An acid-proof plaster is composed by melting 1 part of guttapercha in sufficient boiled oil, and then stirring in 4 parts of rosin which has been previously melted. Apply this mixture hot to the dry wood or metal, and then go over the surface with a hot iron on purpose to drive the cement into all cracks and crevices.

11. A cement or plaster for oil tanks is prepared by making into a paste with a little water (oil can be made to mix with water by means of lime) 5 parts of litharge (ground fine), 2 parts of unslaked lime, 2 parts of quartz sand.

12. An insoluble plaster or cement for paraffin oil tanks: Take 4 parts of strong soda lye and dissolve therein 3 parts of powdered rosin. Stir the compound until all ingredients are well incorporated. Allow it to become cold, and then dilute with 5 parts of water, and when all is properly diluted work in 5 parts of plaster of paris.

13. A solder for metal tanks that are to hold petroleum, kerosene, paraffin, etc.: Melt together 6 parts of lead, 4 parts of tin, 5 parts of bismuth.

14. A water-proof glue for woodwork: Soak 5 parts of glue in water for 12 hours, then pour off any unabsorbed water and dissolve the glue by heating it. Stir in 4 parts of powdered rosin, and when that has melted in the hot glue stir in 3 parts of red ochre.

15. A water-proof cement or putty for metal or wood is prepared by mixing 10 parts (fluid measure) of bisulphide of carbon and 1 part (fluid measure) of oil of turpentine, and then add as much guttapercha as will dissolve in the fluid to a thick paste. The compound so formed is flexible and water-proof, and dries hard as soon as the excess of bisulphide evaporates.

16. A hydraulic plaster or cement is prepared by pulverizing 45 parts of limestone, 2 parts of gray clay, 3 parts of black oxide of manganese (all parts by dry measure). After mixing the mass by sieving several times, calcine them at a dull red heat, and reduce to powder; for use, mix with water and a little sand like ordinary mortar. The limestone may be sprinkled with water and allowed to become reduced to dry powder before mixing with the other compounds.

17. Another hydraulic cement is prepared by mixing in the state of powder 25 parts of lime and 3 parts of manganese iron ore, calcine the mixture, and then reduce it to powder again. For use, mix with a little sand, and then make into a mortar with water.

18. A water-proof cement for marble and stone is prepared by slaking lime by sprinkling it with water, and while this is slaking curdle some milk by adding a little vinegar to it, strain off the curds from the whey through a cloth, and mix this fresh curd with the slaked lime as it is required for use. This cement sets very quickly.

19. An artificial cement is prepared by reducing to powder, and then well mixing by sifting through a fine wire sieve, 6 parts of freshly ground plaster of paris, 3 parts of brickdust, and 4 parts of refinery cinders. For use, mix this compound with water, and shortly before the cement is to be used mix thoroughly with 2 parts of sifted iron filings; use like ordinary mortar, but as thin and soft as possible.

20. To render brick masonry water-proof, repeatedly wash the wall with the following solution: (a) Twelve ounces castile soap, 1 gallon of water; (b) 2 ounces of alum, 1 gallon of water. Brush the wall first with (a) solution. The wall should be clean and dry, and the temperature of the air not below 50 degrees Fahrenheit; laid on boiling hot. Give it twenty-four hours to dry before applying (b) solution, which should be applied when the temperature of the air is 60 to 70 degrees Fahrenheit. After 24 hours repeat the soap and the alum solution, and repeat both solutions alternately at intervals of 24 hours, until the wall is sufficiently impervious to water.

21. A cement for repairing granite is made by reducing to an impalpable powder equal parts of black feldspar and marble dust, and mixing in powdered gum dammar. Heat the mixture until the gum melts, mix the whole by stirring, and then apply to the fractured parts of the granite like putty is used.

22. A cheap cement for many purposes is a mixture of quicklime (unslaked lime) and hot glue.—National Builder.

Finishing Yellow Pine.

A GOOD authority advises against linseed oil as a filler, as it causes the wood to grow darker continually, and recommends this method:

If it is desired to retain the natural color of pine, the wood should be first given a coat of white shellac, sandpapered lightly when dry with fine sandpaper, followed by two or three coats of the desired varnish or finish, allowing each coat ample time to dry before applying another. The first coats should be rubbed slightly with haircloth or curled hair, just enough to destroy the high gloss, and the last coat may either be flowed on and allowed to remain as a bright varnish finish, or rubbed, as may be desired.

If a smooth, dead finish is wanted, rub the last coat, when hard, with pulverized pumicestone and water, using for rubbing a piece of thick felt made for the purpose.

For an egg-shell gloss, which is, perhaps, the most popular finish for interiors, rub the last coat, when hard, with pulverized pumicestone and oil (either raw linseed oil or the rubbing oil commonly used by furniture finishers).

For a polish, rub the last coat first with pulverized pumicestone and water, and then with pulverized rottenstone and water, and a still higher or piano finish can be obtained by giving a further rubbing with furniture polish, used with a little pulverized rottenstone, applied with a piece of soft felt or flannel.

Pine, being a close-grained wood, does not need any filling, but it should always receive a first coat of shellac, as above directed.

With the very best of intentions, a first coat of linseed oil is sometimes given to pine that is to be finished natural, but this gives the wood a dark, muddy appearance, obscuring instead of developing the grain. If a nice job is wanted, omit the linseed oil coat.—National Builder.

Cleaning Hardwood Floors.

PEOPLE who are interested in cleaning off hardwood floors may be glad of some hints on the subject from the practical little journal called the Bautechnische Zeitschrift, which the American Architect translates as follows: Where oil colors or varnishes are to be removed from the surface of floors or furniture, it is usual to treat them with soda. As a rule, a solution of ordinary washing soda is employed, and applied cold. This in time accomplishes its task, but its action is slow, and not very efficient. A far better way is to use caustic soda, which can be bought in iron cans, and use the solution hot. With a hot lye of this sort oil color can be removed in a few minutes, and varnishes nearly as rapidly.

As the solution attacks the skin, it should be applied with a cotton or hemp swab. A bristle brush is useless for the purpose, as the bristles dissolve almost immediately in the lye, leaving nothing but the handle of the brush, while cotton or hemp are not affected. When the wood is clean it should be well washed with water. The strong soda lye darkens the color of oak, but, if this is objectionable, it can easily be corrected by brushing the wood over with dilute muriatic acid, washing it thoroughly as soon as the color is satisfactory, and finishing with a weak solution of soda, to neutralize the last traces of acid. In applying the acid, neither cotton nor hemp can be used, as they are quickly destroyed, but bristle brushes are not affected unless they are bound with iron.

In general, care should be taken never to use muriatic acid in rooms or workshops where iron tools are lying about, as the vapor, even from dilute acid, is quickly diffused through the rooms, and attacks all iron or steel that it can reach. The best way is to make all acid applications in the open air. It is hardly necessary to say that cotton or linen cloths should be worn in using the soda lye, as a drop of lye, falling on woolen cloth, immediately makes a hole.

Greek Masonry.

THE material employed was almost universally the palombino or dove-colored limestone, of which the mountains of Greece are generally formed. The various species of Greek masonry may be conveniently reduced to three classes: 1. Cyclopean—that is, the primitive style of the ante-historical ages. Irregular blocks of stone are here rudely adapted to each other, the interstices being filled up with smaller pieces or with rubble. Such rough walls, hardly to be distinguished at first sight from the masses of broken rock which strew the surface of a limestone country, are called cyclopean because they were of old believed to have been erected by the Cyclops, those fabulous giants of mythology. The best example of this style of masonry is presented in the ruins of Tiryns. 2. Pelasgic or polygonal, where irregular blocks of stone of every variety of angles are compactly fitted together. This is a more refined mode of building than that just described, and derives its name of Pelasgic from the best and most numerous specimens of it being found in Greece and central Italy, which were the principal seats of the Pelasgian tribes. A beautiful example of this polygonal style is exhibited in the walls of Mycenæ, which have been incorrectly called cyclopean by some writers. 3. Hellenic, the rectangular masonry of the later period of Greek art, when the stones were hewn and laid with the most beautiful precision. A splendid example is preserved in the walls of Messene, as erected by Epaminondas. The traveler will fall in with many specimens of a transition style between Hellenic and Pelasgic, and which might for the sake of convenience be named irregular Hellenic—that is, when the polygon is for the most part abandoned and the quadrilateral block substituted in its place, but without attention to the exact symmetry of its form or the parallel course of the layers of masonry. Of course, in Hellenic as in Gothic buildings, it requires some tact and experience to determine the distinction of the transition states. In both cases much must depend on the customs of particular districts and their respective advance in art and civilization.—Stone.

Architectural Models at the Paris Exhibition.

ONE of the most attractive parts of the Paris Exhibition of 1900, at least for architects and builders, should be the Annex, which will contain models of some of the most important modern buildings of the city. They will be very costly representations. The model of the Hôtel de Ville is to cost 58,000 francs. As the model of the great church of the Sacré Cœur on the top of the hill of Montmartre will not be in plaster but in cut stone, the expense will reach a larger sum. The New Sorbonne is also to appear, but the model will cost the comparatively small amount of 25,000 francs The two palaces of the exhibition in the Champs-Elysées, and the Point Alexandre III. will be among the structures to be reproduced on a small scale. Architectural models, which at one time were not uncommon, appear to be out of fashion, but if the collection which will be seen in Paris attains the success that is anticipated we may expect to see a revival of an art with which Shakespeare was better acquainted than with architectural representations on paper.—The Architect.

THE Cortright Metal Roofing Company, manufacturers of the well-known Cortright metal slates, "Victoria" shingles, and roofing sundries, call attention in this issue to the present prices of their products. They use in their standard grade of goods a prime full-weight terne-plate, the cost of which has advanced considerably since the first of the year, necessitating a revision in their selling-prices.

Every one interested should immediately apply for estimates, in order to figure safely and intelligently on any work that may be planned.

The main office of the company is situated at 50 North Twenty-third Street, Philadelphia, Pa.; the Western office, at 134 Van Buren Street, Chicago.

THE NEW FOX PULLEY.

As the Fox Machine Company, of Grand Rapids, Mich., are the originators and one of the largest manufacturers of steel sash-pulleys, our readers will, no doubt, be interested to learn how their new No. 5 pulley is constructed.

Of the accompanying illustrations, Fig. 1 is a perspective view of the pulley, with parts broken away to show

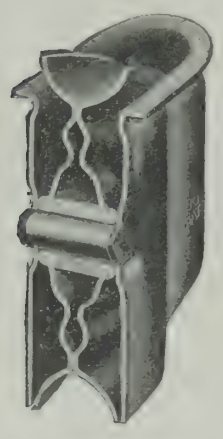


Fig. 1.—The Steel Bushing.

Fig. 2.—Front Elevation of the Pulley.

the steel bushing. Fig. 2 is a front elevation of the pulley. Fig. 3 is a perspective view of the complete pulley. Fig. 4 shows the method of securing the pulley-casing in the window-frame. Referring to Fig. 3, it will be observed that the pulley-casing has corrugated sides,

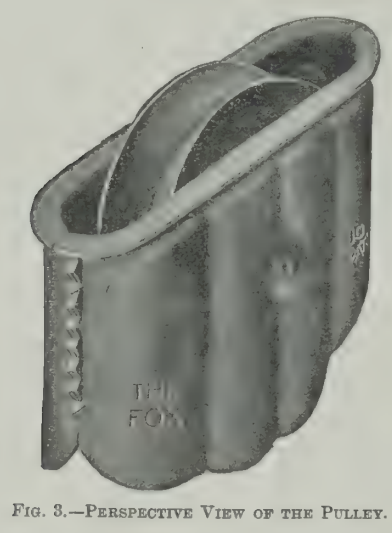


Fig. 3.—Perspective View of the Pulley.

which will exactly fit a mortise made by boring 4 $\frac{13}{16}$-inch holes in line, with centers $\frac{5}{8}$ inch apart. In this respect the new pulley resembles the No. 3 pulley; it differs, however, from the latter in being also used with straight side mortises.

From Figs. 1 and 2 it will be seen that the pulley consists of two steel disks. These disks, as shown in Fig. 1, are firmly held together by a double-shouldered steel bushing, which permits the wheel to run easily, and

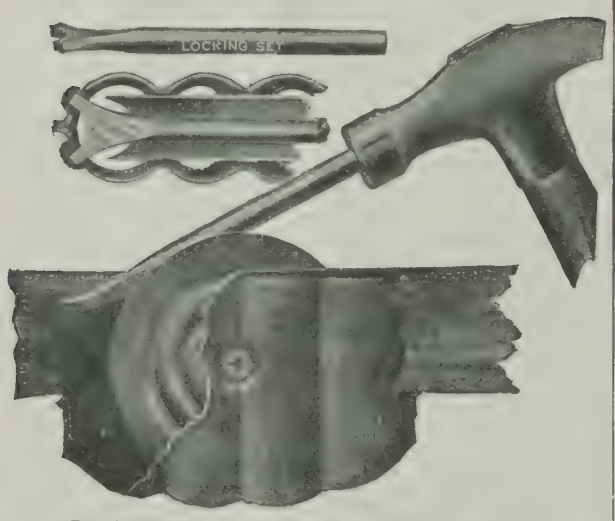


Fig. 4.—Method of Securing the Casing in the Wood.

THE NEW NO. 5 FOX PULLEY.

which forms a highly efficient bearing. The company also makes this bushing of anti-friction bronze. Not the least admirable feature of the pulley is the ingenious method employed for fastening the pulley-casing in place. From Fig. 4 it will be observed that tongues are provided, which are forced outwardly into the wood by means of a punch and hammer, thereby positively interlocking the casing with the window-frame.

The makers will be pleased to correspond with those desiring further information.

Sales-Agencies Established for the Kenney "Flushometer."

The merits of the Kenney "Flushometer" have caused it to be adopted in most sections of the country. The hearty and unqualified indorsement of the Army and Navy Departments of the United States Government stamp it as a most desirable substitute for the noisy and troublesome overhead supply-tanks heretofore used in bathrooms. In order more conveniently and readily to meet the increasing call for the "Flushometer," the manufacturers have arranged with a number of firms prominent in the trade, who, as agents, will hereafter distribute the "Flushometer" from the various points in the United States at which they are located.

The high standing of these agents, and the fact that each will devote a special department of his business to the interests of the Kenney "Flushometer," lend additional weight to the claims of the manufacturers, and make them worthy of the consideration of sanitary engineers, architects, and plumbers.

The names of the agencies secured are as follows: L. Wolff Manufacturing Company, Chicago, and Denver, Colo.; Haines, Jones & Cadbury Company, Philadelphia, Pa.; Ahrens and Ott Manufacturing Company, Louisville, Ky.; N. O. Nelson Manufacturing Company, St. Louis, Mo.; National Supply Company, Toledo and Cleveland, Ohio; United States Water and Steam Supply Company, Kansas City, Mo.; United States Supply Company, Omaha, Neb.; Detroit Lead Pipe and Sheet Lead Works, Detroit, Mich.; Western Supply Company, St. Paul and Minneapolis, Minn.; Geo. B. Hawley, Cincinnati, Ohio; Geo. E. Gilchrist, Boston, Mass.; Fort Pitt Supply Company, Pittsburg, Pa.; Roe & Conover, Newark, N. J.; James Robertson Company (Limited), Montreal, Toronto, Winnipeg, and Manitoba, Canada.

A DEPARTURE IN RIPPING-SAWS.

A new self-feeding band ripping-saw has been designed and built by the Egan Company, 209 to 229 West Front Street, Cincinnati, Ohio.

The column of the new machine is very heavy, and is perfectly free from vibration. The table is of ample size, and has, at the front, a plainly stamped index. Idler-rolls are fitted in the table to overcome friction. A cam-lever releases, moves, and clamps the fence, accomplishing the adjustments most quickly.

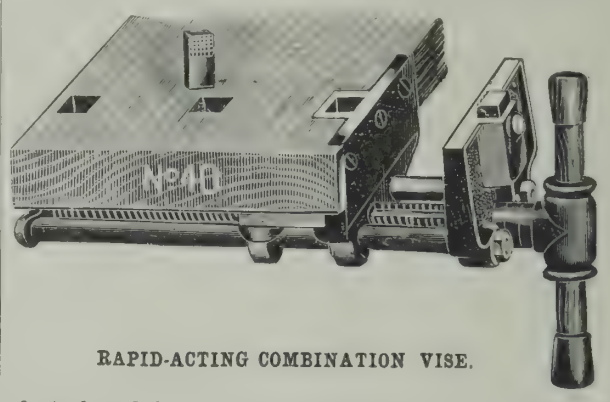
The wheels are forty-two inches in diameter, and are made entirely of iron and steel. The upper wheel is light, yet strong, and is provided with spokes; the lower wheel is heavy, has a solid web, circulates little dust, and gives increased movement to the lower wheel, so that its speed governs that of the upper, preventing the upper wheel's overrunning the lower. The wheel-shafts are of especially heavy steel, and run in long bearings; the upper wheel is fitted with an improved straining device. This straining device (controlling the upper wheel and the path of the saw-blade on the face of the wheels) is longitudinally and laterally adjustable, and is regulated by an adjustable weight, and by a compound lever so sensitive that, whatever may be the vibration, the strain takes up the slack in the blade instantly.

There are three speeds of feed, namely, sixty feet, ninety feet, and one hundred and thirty-five feet per minute. The feed is powerful, and the driven feeding-in and feeding-out rolls are placed close together, enable short stock to be worked to profit. The feeds are vertically adjustable by means of the long lever at the top. The feeds may be instantly stopped or lifted out of the way for use as a hand-feed rip saw by a single movement of this long lever.

Hand-wheels and levers are in easy reach of the operator for stopping and starting the machine.

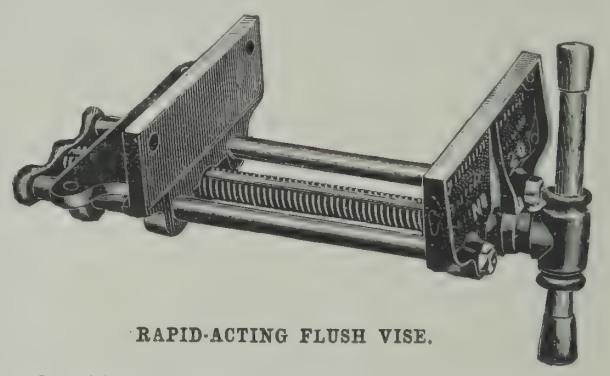
RAPID-ACTING COMBINATION VISE.

We illustrate herewith two rapid-acting vises for woodworkers which are being extensively used in the best shops of the country. These vises are constructed



RAPID-ACTING COMBINATION VISE.

of steel and iron, and are operated by a 1¼ square-thread steel screw, which, owing to its peculiar construction, allows the jaws to be adjusted almost instantly to any thickness of work. The operation is much like the breech-block of a modern gun in so far as it allows the parts to be brought together instantly and to be secured, the object being to save the loss in time in changing from a thin to a thick piece of work. These adjustments are



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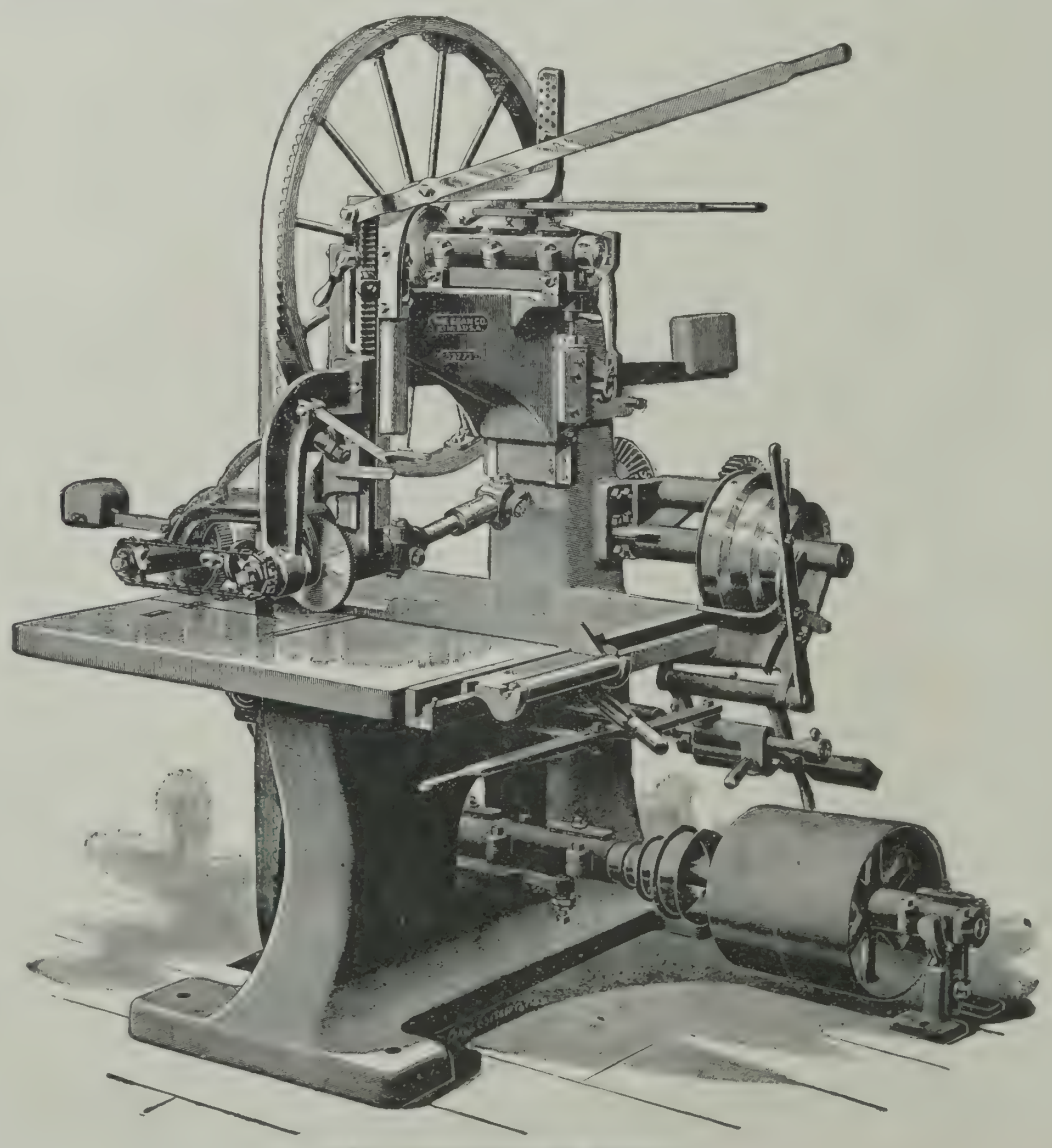
made without the use of triggers, racks, cams, or like devices, which have a tendency to break and wear out. Large numbers of the vises are in use in manual training schools, and have stood the severe use of the students. Elsewhere will appear the advertisement of the inventors and manufacturers, W. C. Toles & Co., Irving Park, Chicago, Ill., who will cheerfully furnish prices and further particulars.



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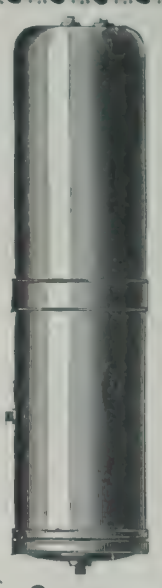

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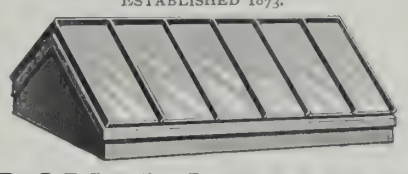

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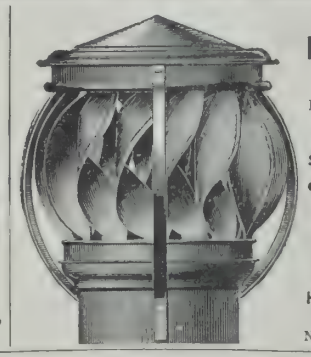

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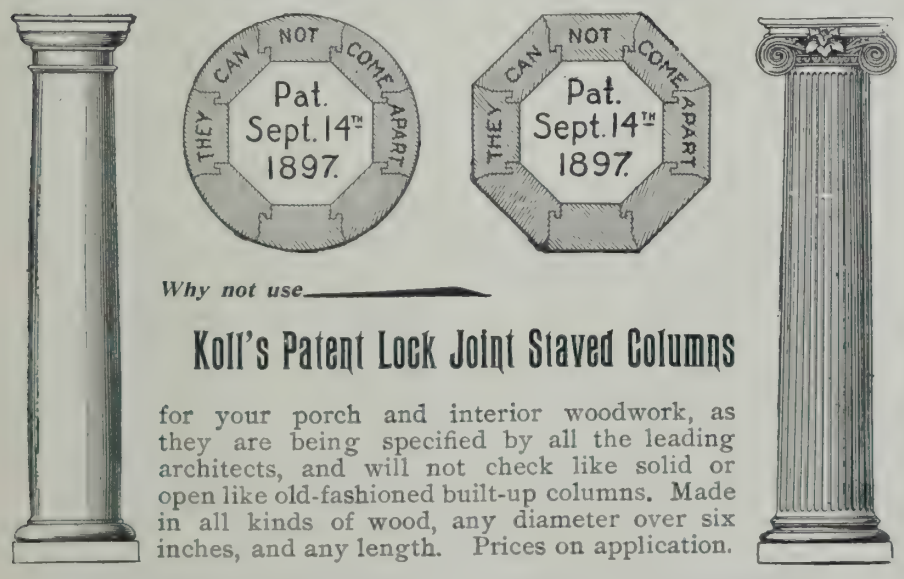

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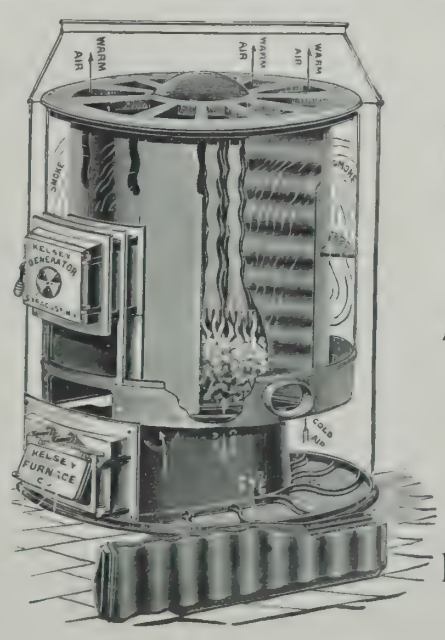

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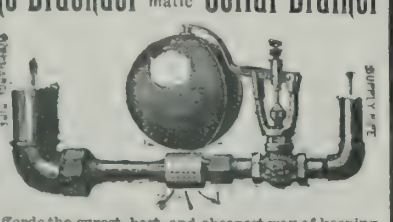

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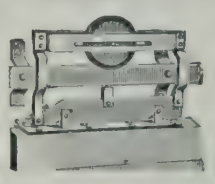

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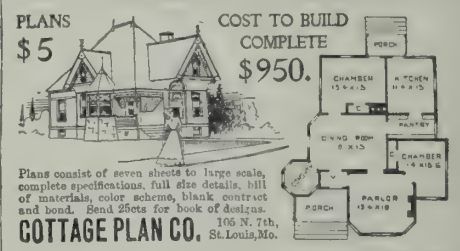

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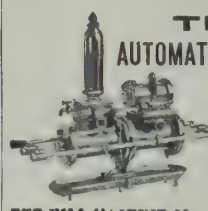

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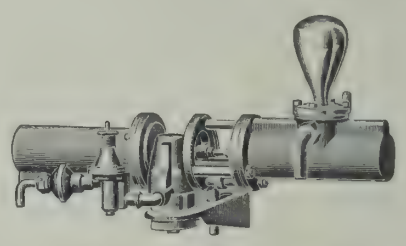

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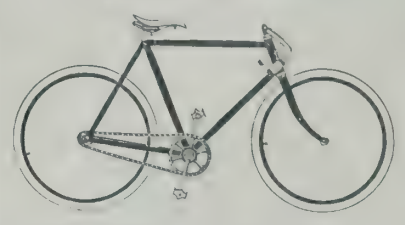

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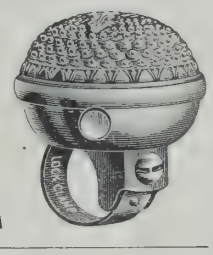

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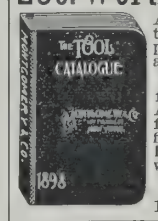

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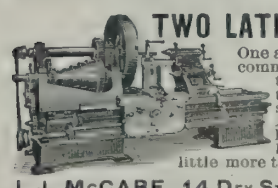

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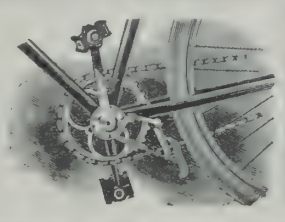

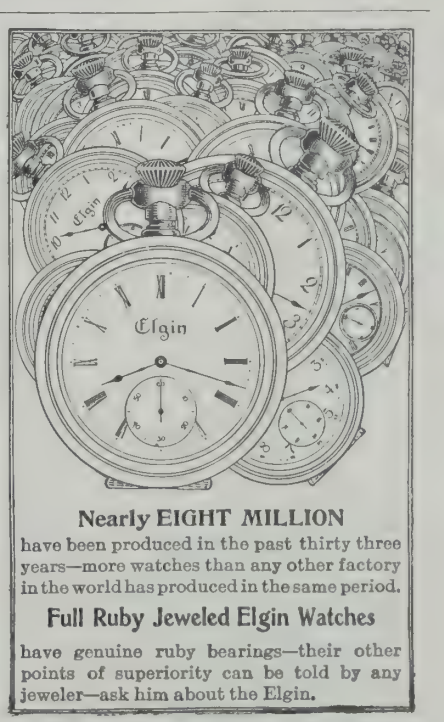

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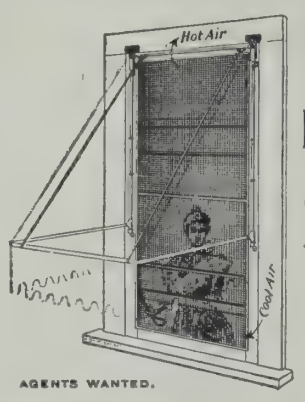

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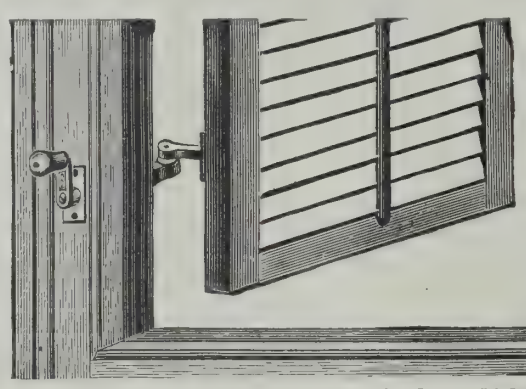

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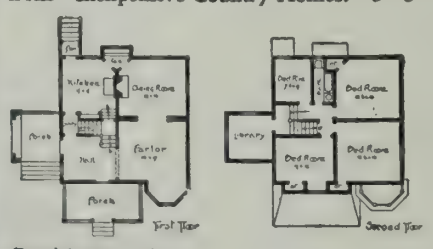

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INTERIOR VIEW OF HALL AND STAIRCASE—A RESIDENCE AT NEWARK, N. J.—See page 93.

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AN ARCHITECTURAL SYMPOSIUM.

AN unaffected school of modern architecture in America—Will it come?

This question has been put to six architects practicing in New York, Boston, Chicago, St. Paul, to four professors of universities, and to one architectural critic. The T-Square Club, of Philadelphia, which does for that city what the Architectural League does for New York, is warmly to be commended for their effort in getting the views of gentlemen eminent in the architectural world, either as architects or critics of architecture. The letters and their answers have been published in the catalogue of the architectural exhibit at the Academy of Philadelphia, and forms a symposium of great interest.

Mr. Lewis H. Sullivan, of Chicago, one of the brightest men in the profession to-day, says: "In reply to your inquiry, 'Do you see as yet any signs tending to indicate the development of an indigenous architecture in America?' I say that in my judgment there are such signs and indications, but they are not as clearly defined as I should wish to see them. The opportunities for developing an indigenous art are so abundant, so fertile, so convincing, that I must confess to a sincere surprise that progress toward that end had not been more spontaneous and more significant. It is not to my mind a thinkable proposition that from a people democratic and free, self-reliant and resourceful, in possession of their own bodies, in possession of their own souls, there shall not some day appear as an exhalation an architectural art germane to those gifts, responsive to that throb, eloquently voicing every form, every aspect of what is genuine in our national life." Mr. Sullivan considers that architecture as now generally practiced is feudal or monarchical, an architecture of the governed for the governing, and he further says that it is not toward this we aspire as a nation and as individuals. It is not, therefore reasonable to suppose that the art forms of a people which are not free can really express the life of free people, yet this is the popular supposition. American architects as a class must become indigenous, that is to say, American in thought and example. The majority are not.

Mr. D. H. Burnham, architect in chief of the World's Fair of 1893, says: "There is little in the details used on the exterior of our buildings that is exclusively American; but architecture is not detail—it is the whole expression of a building, and in their whole expression they are American buildings, they are national and original, and some of them are good from an artistic standpoint."

Mr. Ernest Flagg says: "An architectural style is invariably the result of an evolution, and is, therefore, necessarily affected by what went before. I do see, however, what appears to me unmistakable signs that indicate that such an evolution along logical lines is about to take place, an evolution which, I am convinced will result in the formation of a distinctly national, ever-changing, that is to say, live style of architecture. Our architecture is soon to pass through—I may say that it has already entered upon—the first stage of a most important crisis. Heretofore we have had, and at the present time we have no such thing as American architecture, though we have architecture in America. All the fashions and phases through which it has passed have been importations, and all, with the exception of the Colonial period, have been illogical, and therefore not lasting. The true principles of good taste and design which seem to have guided our Colonial architects unfortunately did not take root deep enough to long survive the shock of our separation from the mother country. Since then we have imported fashions, losing sight of the principles, the use of which resulted in those fashions—principles which, if we could have retained them, would have given us fashions of our own, in other words, a national style." Mr. Flagg's letter is very interesting. He lays considerable stress upon the value of French training of architects. Mr. Russell Sturgis gives a negative answer to the question.

Mr. John M. Carrère thought that there was undoubtedly a good deal of intelligence and growing interest in matters of art generally, and in architecture particularly, in this country; but he said that it would be very difficult for him to express an opinion concerning the development of an independent modern style or school of architecture in America. The development of any style of architecture must necessarily be very gradual, and with the complicated conditions of modern art, even more so, as nationality itself is becoming very much less distinct. The most encouraging feature of architectural work in this country, thinks Mr. Carrère, is the fact that much of it is receiving thoughtful and careful study, and that composition is being recognized as paramount to detail. The problems which we have had to solve, and the conditions under which they are to be solved—both mental and physical—are novel. So far, we have been trying to adapt the solutions of problems of the past to the problems of the present. These adaptations in most cases have lacked seriousness and purpose. With the higher education of the architect and the public in these matters, the work is becoming more serious, and this may be and should be the first step toward the development of a local or national style of development. It really seems as though Mr. Carrère has really answered the question, and his allusion to the public's share and responsibility is entirely true, for no branch of art will ever reach its highest achievement until there is co-operation by the layman.

Professor Ware, of Columbia University, thinks that American requirements and opportunities are already making our buildings quite unlike those of other people. He thinks that our architects need not be ashamed to assimilate whatever of old or of foreign which is adaptable to our special conditions. He thinks that if a little more attention was given to developing the architectural possibilities of the new materials and of the new methods of construction now at hand, and to give to buildings an architectural character suitable to their purposes, either by exhibiting upon the exterior the disposition of the plan or by more purely artistic means of expression and to the study of masses and the larger elements of composition, all will be well. Mr. R. A. Cram, of Boston, gives a prompt decided negative to the question. He is particularly severe upon the Romanesque revival and the École des Beaux-Arts tendency, saying that "the teachings of Paris are grotesque when applied to the architecture of most of our churches, while, on the other hand, the style which would fit this would be absurd if applied to an office building or a city hall. All we can do, I believe, is to use as intelligently as possible various styles of more fortunate periods, endeavoring constantly to adapt them to modern requirements, also giving them wherever possible an element of modernism that will save them from a dead archæological quality and give them a certain amount of vitality." To obtain a national ethic and logical style, he also adds, would it not be well for us to make some effort to bring our civilization into harmony with those of the past, which invariably expressed themselves distinctively in artistic forms? Mr. Cram says, however, that this is a purely personal expression of opinion. Mr. Cass Gilbert says that the evidences of the development of an individual style in its earliest stages must necessarily be slight, and, if the architecture of our country is beautiful and appropriate, the question of originality will take care of itself.

Professor Laird believes that the only means by which we can promote the growth of an American school of architecture which will be worthy of the great future of this country will be to the education of those who enter the profession. Mr. Charles Eliot Norton thinks that there is nothing of distinctively American growth in our architecture as yet, nor is anything of the kind likely to exhibit itself—or, in his opinion, to be aimed at as specially desirable. The conditions of the civilized world, whether in Europe or America, are, as far as architecture is concerned, largely similar, and there is no reason why we should expect in this country any specially distinctive style. It is as if we were to ask for specially American style in literature.

Professor Van Pelt says that the best examples of art are now made universal; therefore, he does not believe that America will develop a characteristic style, but there will be a tendency to the generalization of each style, and that eventually all countries will exhibit nearly the same characteristics.

This symposium is of great interest and has some value, and would have undoubtedly more value if the question had been worded differently. However, it answers a good purpose in eliciting eleven opinions from men eminent in this profession.

EQUESTRIAN STATUES.

IT is not an easy matter to determine the number of equestrian statues in the world, but Mr. S. H. Kauffmann, of Washington, has succeeded in making a very good approximation to the exact number. Many years ago a weekly paper published in Washington touched upon the subject, and tried to enumerate the equestrian statues of the world. This led Mr Kauffmann to interest himself in the matter, and since that time he has made exhaustive researches on the subject. He found the field a new and attractive one, and he began to make trips abroad in search of equestrian statues which had been forgotten or overlooked, and in the course of time he has collected a very interesting and important collection of pictures to illustrate what may be a unique book on the subject. He soon found that the ordinary cyclopedia and guide-book were of little value in gathering information. His search for works of which he had heard, and which the authorities had lost sight of, proved instructive and entertaining, and sometimes he made genuine finds. As a result of years of inquiry and personal research, Mr. Kauffmann has collected data which lead him to set down the number of equestrian statues in the world as about two hundred and eighty-five. They are all statues "in the round," and are erected as memorials of emperors, kings, soldiers, statesmen, and in some instances to women. In addition, there are a number of groups which represent allegorical or ideal subjects. Not a few of them are in churches, and even over tombs in Italy. The City of Washington has seven, and the City of New York (Borough of Manhattan) two equestrian statues.

WHAT TO DO WITH THE BACKYARD.

The average backyard of a city house is one of the most dreary deserts in the world, and it is little wonder that in many houses of the well-to-do and the rich the view of it is masked by conservatories or by stained glass windows. The average city backyard is composed of several elements which are nearly constant in all. Three fences, four clothes poles, a small extent of flagging near the kitchen door, with a stone walk a few inches wide leading away from it, and two or three beds filled with stunted weeds usually form the sum total. If the yard belongs to a person of wealth, a few hundred dollars judiciously expended will turn it into a bower of beauty. A trellis may be built over it on which vines may be trained, and with the aid of a few lanterns it can be rendered a delightful spot for spring and summer use, and al fresco entertainments can be given in it which will long be remembered by those that attend them. The addition of a few casts, or even one or two marble statues, or one of those beautiful decorations of Italian gardens, a "Hermes," can be added to advantage. One great sculptor has successfully solved the problem of the backyard by utilizing it as a studio. However, most owners of houses prefer to have the yard left open.

What may be done in the way of floriculture in city yards depends very largely upon the amount of sunlight which is available. The high fences of city yards prevent many beautiful flowers from flourishing, as they need almost continuous sunlight. There are, however, many varieties of flowers that one may raise even in the restricted space of such narrow beds as can be spared from utilitarian uses. A large rockbed offers one of the best schemes of display, and such a bed is usually visible from the back parlor and bedroom windows. A rockery placed in the centre of the grass plat or toward the far end of the yard will not interfere to any great extent with the Monday abomination, the weekly wash, if the laundress is careful in hanging out the clothes. Rocks are easily obtainable, and if they are not available an arrangement of boxes supported on rustic posts will answer. If boxes are used, they should be covered with bark or else stained a dark Indian red; in no case should they be painted green. The narrow beds along the fence should be prepared by a florist with great care, the soil being enriched and pulverized with the aid of plenty of hoeing and raking.

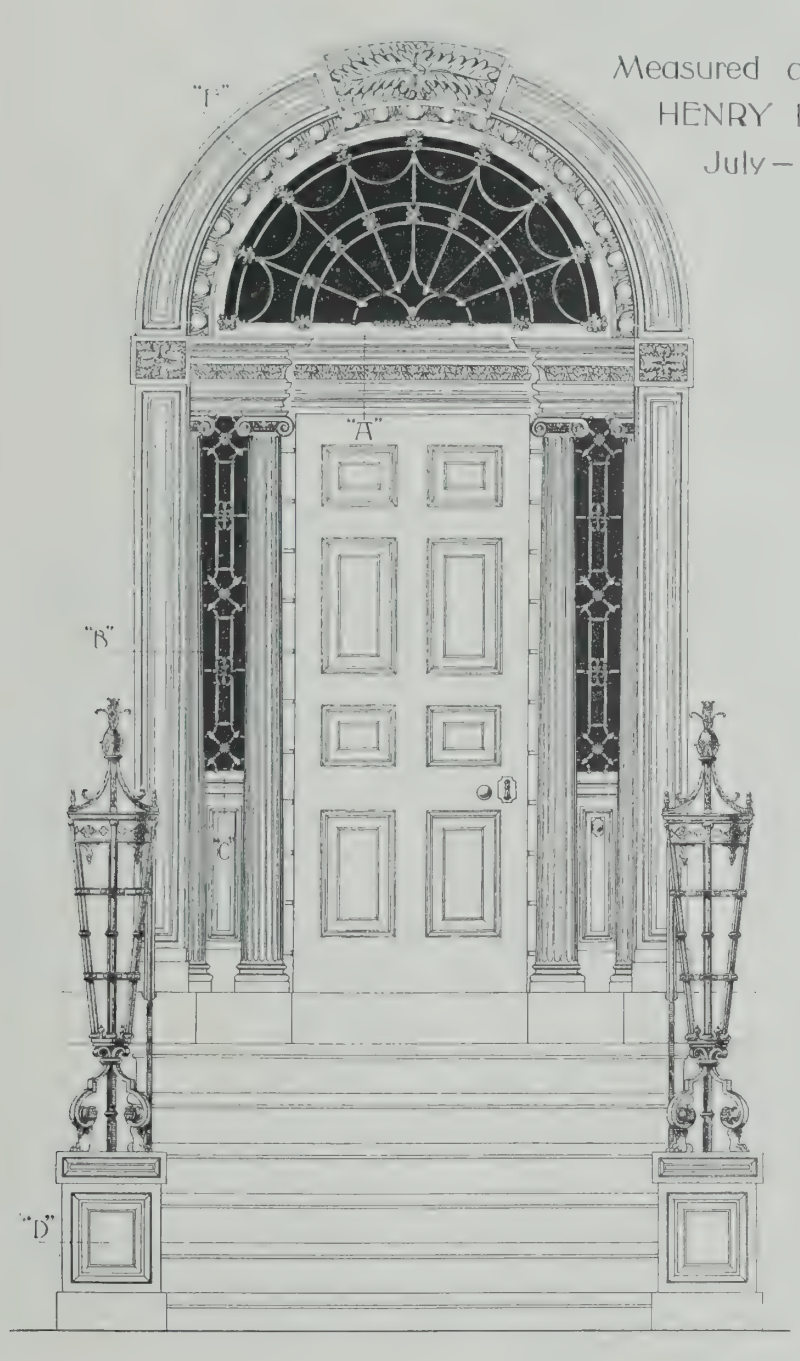
For a beginning it is well to purchase young plants from some florists, so as not to depend altogether on sowing seed. Among the best flowers are carnations, clove pinks, phloxes, and chrysanthemums. There should also be at least one rosebush, and the varieties which can be obtained are legion. The yucca is also recommended. These flowers will do for the long beds at the side of the fences, and for the rockery or box centerbed geraniums, verbenas, alyssum, calendulas, carnations, and dwarf stock gillyflowers are recommended. They should be planted toward the middle of the boxes, in order that Tom Thumb trailing nasturtiums can be planted in front.

If there is space, a miniature aquatic garden can be started by sinking one or two tubs in the soil. The tubs should be sunk nearly to the rim; the bottoms should be covered to the depth of several inches with well rotted black manure and good loam, and over this is sprinkled two inches of sand. The tubs are then filled with water, and the flowers are placed in them. Water-lily bulbs are specially recommended; the tubers are gently pressed into the soil, and are then covered with water, which is renewed from time to time as evaporation takes place. Almost

any dealer in seeds issues a large catalogue, from which the an ateur gardener can make a selection of seeds suitable for the purpose, and many of them are illustrated with elaborate colored plates. With the judicious expenditure of a few dollars the most dreary of places, the backyard, can be rendered a perfect bower of beauty.

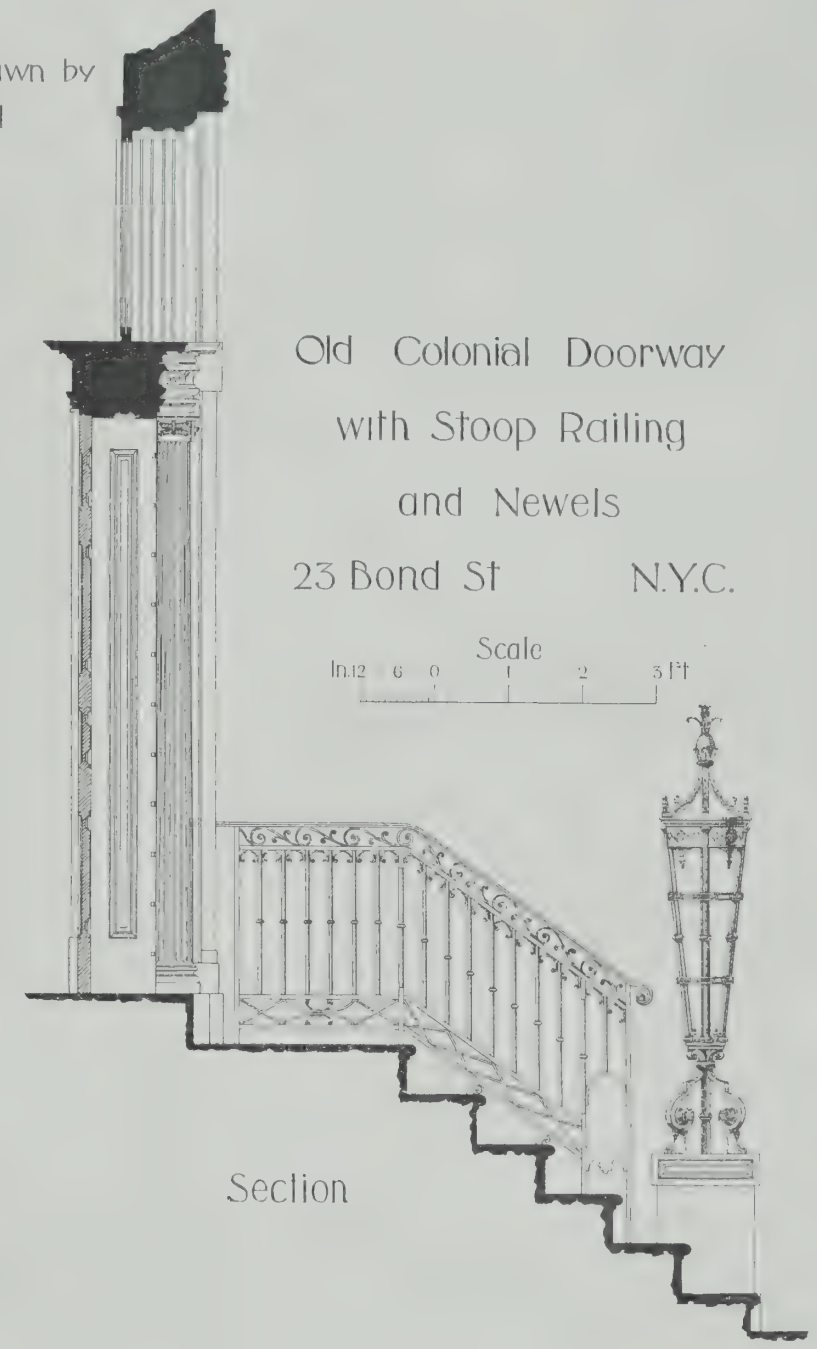
ARCHITECTURAL EDUCATION IN THE UNITED STATES.

A COMMITTEE appointed by the American Institute of Architects reported upon the subject of architectural education at the last annual convention. The first architectural school in the United States was established in 1869, at the Massachusetts Institute of Technology, by Prof. W. R. Ware, who is now Professor of Architecture in Columbia University. Since that time flourishing schools have been established at Cornell, the University of Illinois, Columbia University, Syracuse University, University of Pennsylvania, University of Chicago, Harvard, Tulane, and McGill Universities. Since their establishment no less than 3,250 students have received instruction; 650 have graduated, and a large number are now in practice. The committee favored the establishment of an educational requirement for admission to the Institute, and suggested that the diploma of a graduate of a recognized school might be accepted in lieu of an examination.



Elevation

Measured and Drawn by
HENRY RAUSCH
July – 1898



Section

Old Colonial Doorway
with Stoop Railing
and Newels
23 Bond St N.Y.C.

Scale
In. 12 6 0 1 2 3 Ft

A SUMMER HOUSE AT SEA GATE, L. I.

WE present herewith, on page 91, a summer house which has been erected recently for Mrs. Julia M. Meyer, at Sea Gate, L. I. The building is treated in the gambrel roof order in an excellent manner, and its most attractive feature of the exterior is the piazza, which is broad, spacious, and well shaded. There is a cellar under part of house, with brick walls and a cemented bottom; the remainder of the cellar is left open, and the building is supported on posts. The exterior walls are sheathed, and then shingled and painted a greenish gray, with yellow trimmings. The roof is shingled and painted a darker green. Dimensions: Front, 52 ft. 6 in; side, 28 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior is trimmed with ash throughout, and it has floors laid of yellow pine, and oiled. The hall is provided with a very unique staircase, with a massive newel post, carved, and an open fireplace, handsomely treated with old blue and white tiles as facings, rising up to the ceiling, and also a hearth. The entrance door has stained glass windows on either side of same The reception room is finished in an artistic manner; it has an open fireplace, furnished with white tiled hearth and facings, and a Colonial mantel with columns. The billiard-room occupies what is called the library, and is provided with the usual fixtures and a Dutch open fireplace, built of pressed and ornamental brick, with hearth and facings of same, the latter running to ceiling. The dining room has a similar fireplace, with shelves upon the chimney breast, which are ornamented with old Delftware. This room has also a Dutch door opening on to porch. The kitchen, pantry, and laundry are fitted up in the best possible manner, with the usual fixtures. At the rear of the house are two bath boxes, provided with seats, etc. The second floor is trimmed with similar wood. It contains five bedrooms, seven closets, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed plumbing. The stairway to third floor is a very attractive one, and is quite an unusual feature, having it built in the manner shown on plan. The third floor contains two bedrooms and ample storage. Messrs. Constable Brothers, architects, 22 East Sixteenth Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN DWELLING AT SPRINGFIELD, MASS.

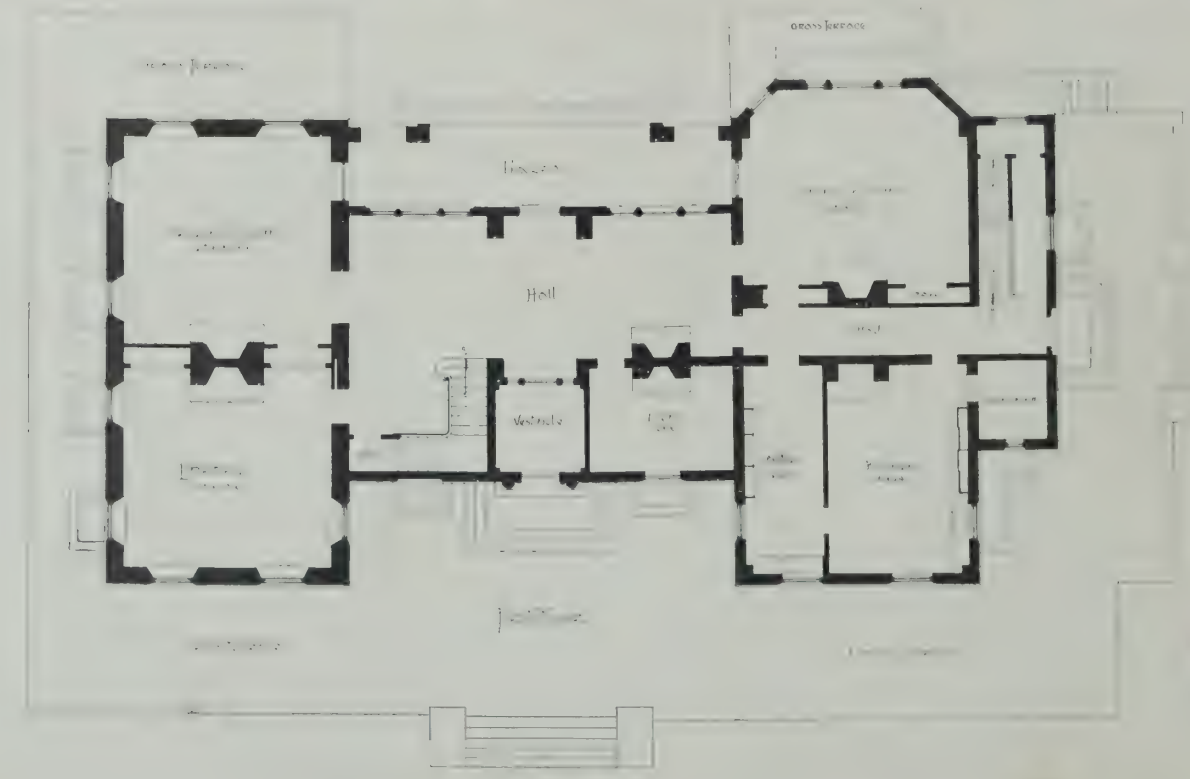
THE engravings presented on page 86 in this issue illustrate a modern dwelling recently erected for Chester J. Dayton, Esq., at Springfield, Mass. The design shown is a good example for a modern dwelling, and it is treated in a simple manner, with the lines well broken by the piazza, balcony, bay windows, etc. The underpinning is built of red brick laid up in red mortar. The superstructure is of wood, and is covered with sheathing and paper. The first story is covered with clapboards and painted bottle green, with white trimmings. The second and third stories are shingled and stained green. The roof is also shingled and stained green. Dimensions: Front, 33 ft. 6 in.; side, 33 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The hall is trimmed with ash, and it contains an ornamental staircase turned out of ash, with rail. The library is trimmed with ash, and the parlor and dining-room with oak. The parlor contains an open fireplace built of brick, with tiled hearth and facings, and mantel. The dining-room has a china cabinet built in nook, with leaded glass doors. The pantry and kitchen are wainscoted and furnished with all the best modern conveniences. The second floor is trimmed with oak, and it contains four bedrooms, with large closets and bathroom, the latter wainscoted and fitted up with the best modern fixtures and exposed plumbing. The third floor contains three bedrooms and ample storage room. A cemented cellar contains furnace, laundry and other necessary apartments. Cost, $3,000 complete. Mr. F. W. Lathrop, architect, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

COLONIAL ARCHITECTURE IN NEW YORK.

THE accompanying cut on this page represents an old doorway, at 23 Bond Street, with railing and ornate newel posts of the Colonial style of architecture. It is reproduced from careful measurements, showing the plan, elevation, and section of same drawn to scale; also giving detail sections of mouldings, etc., at various places as indicated. The neighborhood in which this house is situated was, forty or fifty years ago, a very fashionable part of the city. The houses on this plan, like many others in the same street, now being used as business premises, were erected long before that time. This particular doorway is exceptionally well preserved, rendering it less difficult of reproduction than many others still in existence, the latter being worn and disfigured by neglect and carelessness.

This design was made by Henry Rausch, specially for the Building Edition of the SCIENTIFIC AMERICAN.



A RESIDENCE AT NEWARK, N. J.—See page 93.

MESSRS. McKIM, MEAD & WHITE, ARCHITECTS.

A RESIDENCE AT NEWARK, N. J.—See page 93.

MESSRS. McKIM, MEAD & WHITE, ARCHITECTS.

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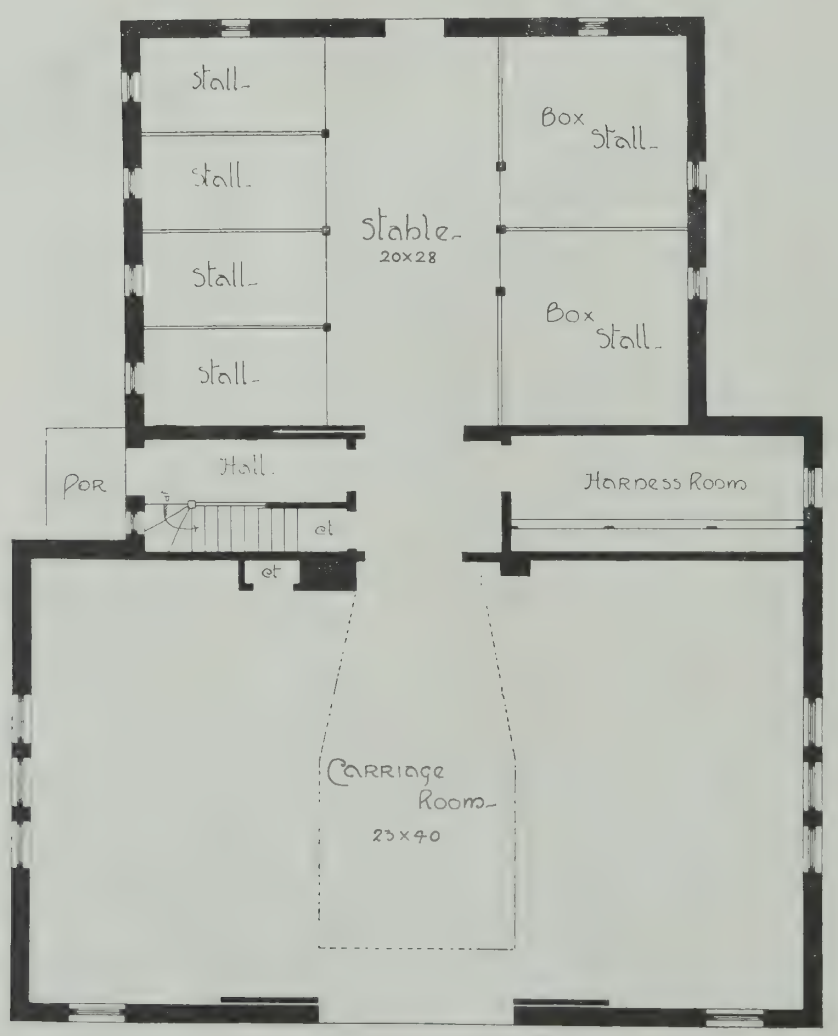


Ground-plan.

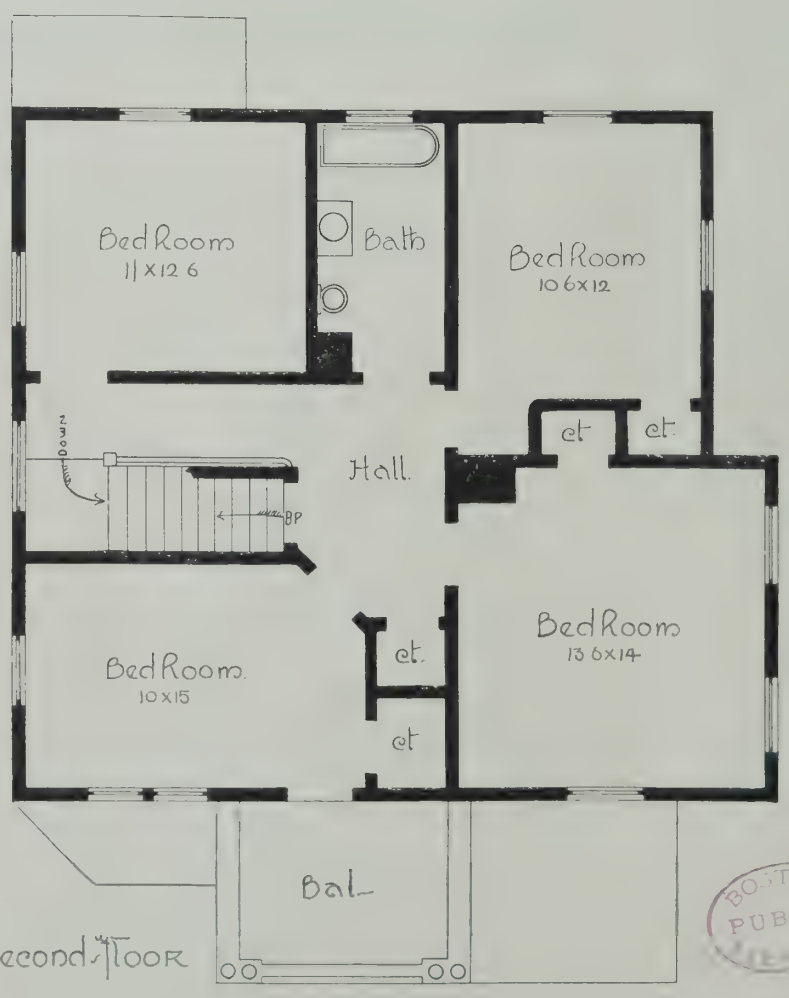
A STABLE AT NEWARK, N. J.—See page 94.

MESSRS. McKIM, MEAD & WHITE, ARCHITECTS.

BOSTON PUBLIC LIBRARY

A DUTCH COLONIAL HOUSE AT FLATBUSH, L. I.—See page 95.

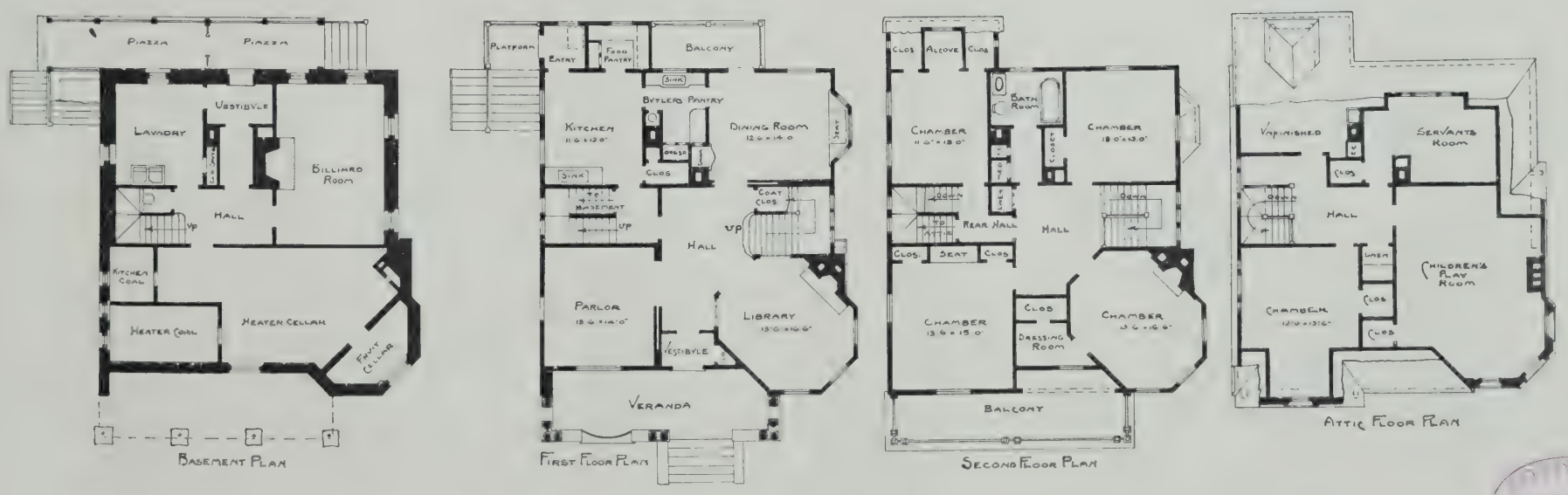
MR. JOHN J. PETIT, ARCHITECT.



BOSTON PUBLIC

A MODERN DWELLING AT SPRINGFIELD, MASS.—See page 81.

MR. F. W. LATHROP, ARCHITECT.



A MODERN RESIDENCE AT WORCESTER, MASS.—See page 94.

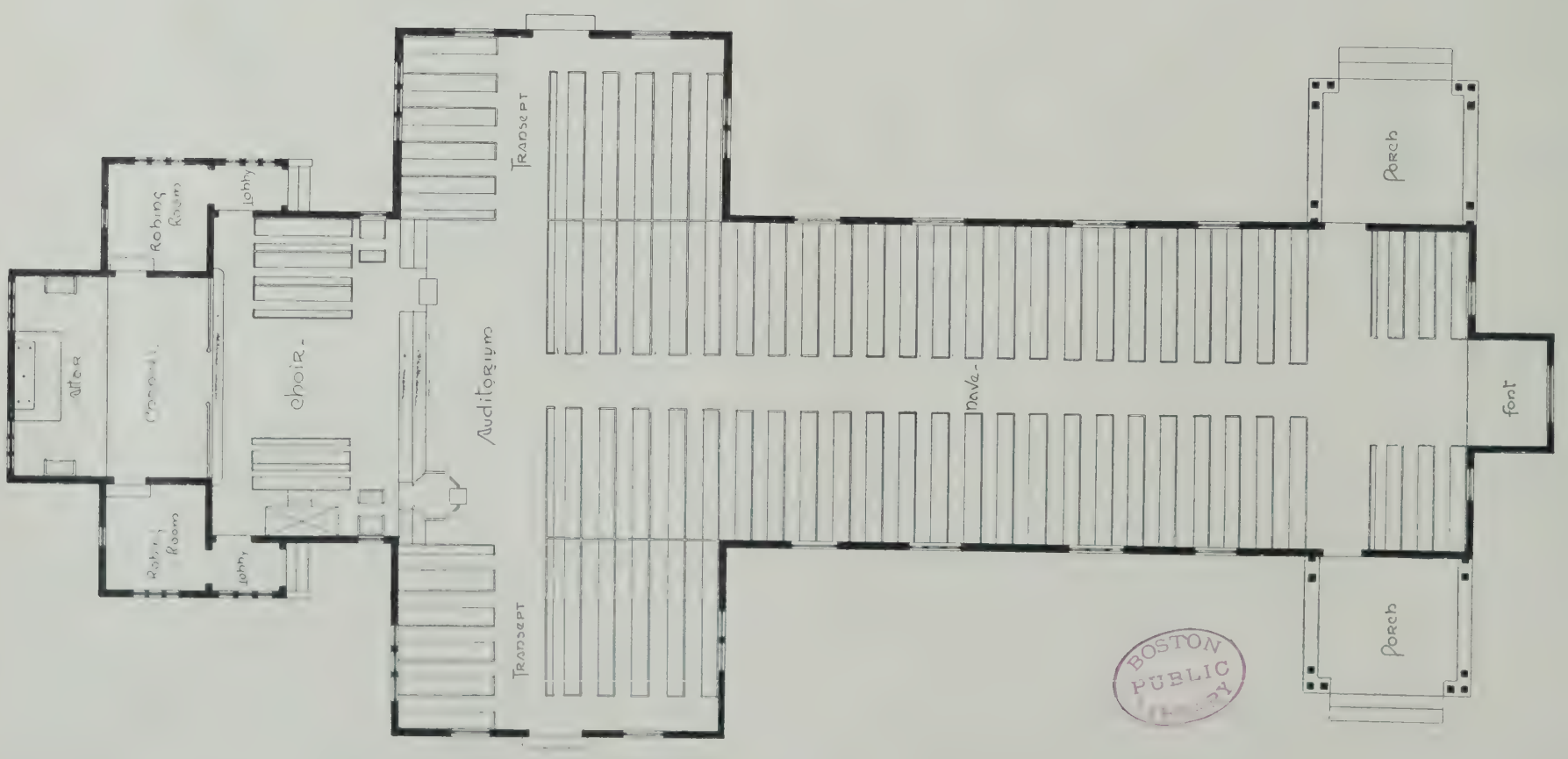
MR. LUCIUS W. BRIGGS, ARCHITECT.

A PAIR OF TWIN HOUSES AT OVERBROOK FARMS, PA.—See page 94.

MR. WILLIAM L. PRICE, ARCHITECT.

A COLONIAL RESIDENCE AT SPRINGFIELD, MASS.—See page 93.

MESSRS. J. D. & W. H. McKNIGHT, ARCHITECTS.

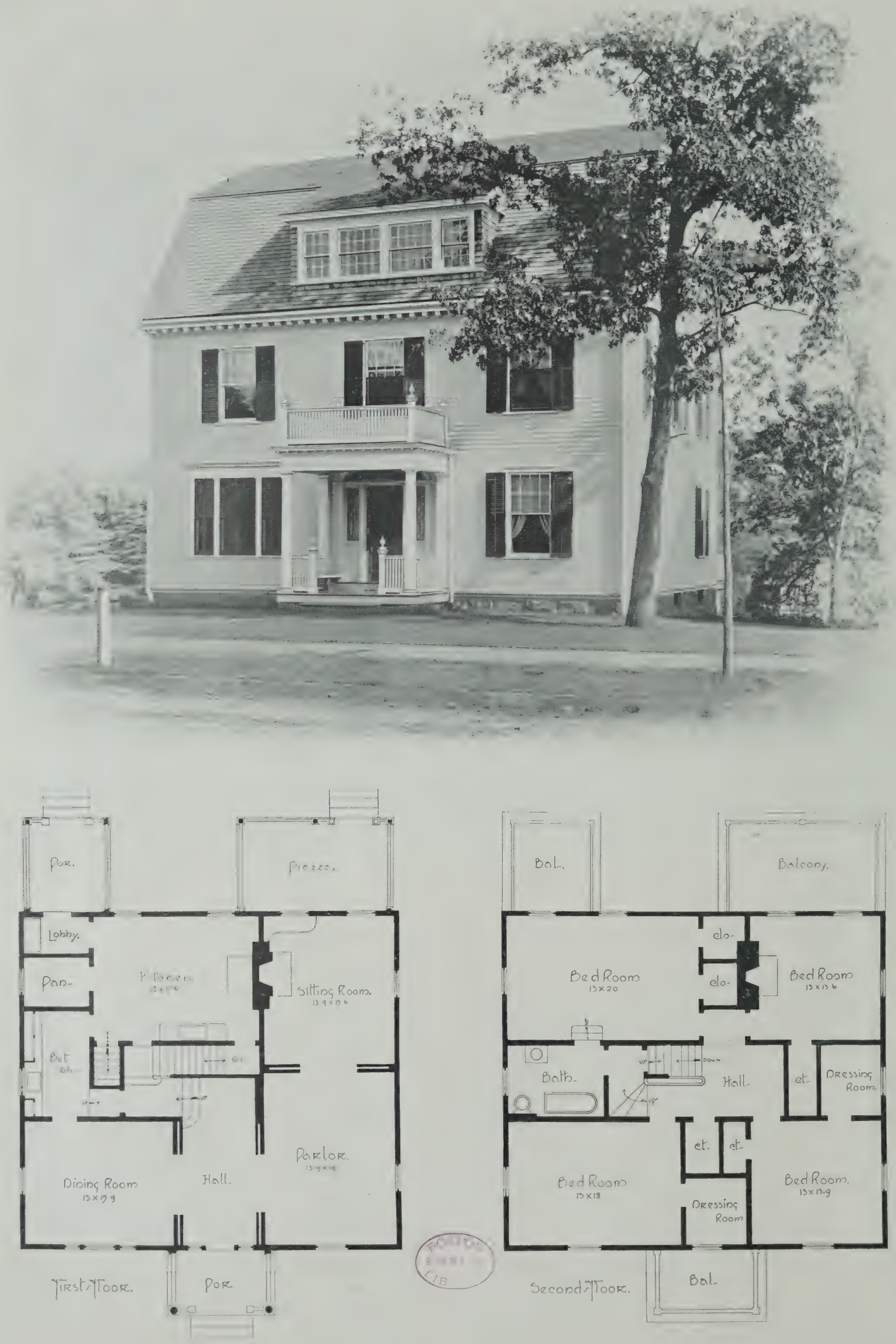


BOSTON PUBLIC

ST. JAMES' CHAPEL, ELBERON, N. J.—See page 95.

A SUMMER HOUSE AT SEA GATE, L. I.—See page 81.

MESSRS. CONSTABLE BROTHERS, ARCHITECTS.



A COLONIAL RESIDENCE AT NEW HAVEN, CONN.—See page 95.

MR. L. W. ROBINSON, ARCHITECT.

THE CATHEDRAL OF MÜNSTER.

AMONG the many old structures of the City of Münster, which have been preserved to this day, perhaps none is of such importance both architecturally and historically as the cathedral. On a spot south of the "old cathedral" (alte Domkirche), built by Bishop Ludger (802-809), on the northern slope of the Horsteberg, the ninth bishop, Duodo (969-993), erected a larger "new cathedral" (neuer Dom), to which various structures were added by the successors of Duodo. The three bishops, Friederich II. (1174-1203), Ludwig I. (1169-1173), and Herrmann II. (1174-1203), erected the towers, and the intermediate so-called "old choir." Under Bishop Theodoric II., of Isenburg, and his successors, these structures were completed after forty years of labor. Finally, in 1265, Bishop Gerhard von der Mark consecrated the entire building. Centuries have not passed over the cathedral without changing much and adding to the structure. The main building, however, still retains many of its mediæval features. The main structure is a vaulted triple naved basilica, having an east and a west transept, a western choir between the two square towers, and an eastern pentagonal tower adjacent to the choir. The towers and the intermediate "old choir," so-called to distinguish it from the other choir, are built of quarry stone and freestone; the remaining parts of the building are composed of ashlar. With the exception of the brick vaults of the transepts, the vaults are all built of massive blocks of quarry stone. In the roofs, sheet copper has been used. The exterior of the Münster Cathedral does not present the picturesque magnificence of most Rhenish churches of this period: but, on the other hand, it has an aspect of quiet dignity not found in most German mediæval basilicas. The entire structure is of interest, not only because it affords examples of the different architectural styles which were prevalent during the period of its development, and which are embodied in the various extensions and additions, but because of its vast, splendid interior, which produces an impression not made by any other mediæval structure in Germany.—Blätter für Architektur und Kunsthandwerk. Verlag von JULIUS BECKER, Berlin, SW.

THE CATHEDRAL OF MÜNSTER.

A COLONIAL RESIDENCE AT SPRINGFIELD, MASS.

WE present on page 89 in this issue a residence of Colonial treatment, which has been erected for Messrs. J. D. and W. H. McKnight at Springfield, Mass. The building is constructed of the best materials, and in a thorough workmanlike manner. It is treated in an excellent manner, with good detail and many features, including a porch at front with Ionic columns. The underpinning is built of red-faced brick, laid up in red mortar. The superstructure above, of wood, is covered on the exterior with sheathing paper and clapboards, painted Colonial yellow, with white trimmings. The roof is shingled and stained a dark green. Dimensions: Front, 33 ft.; side, 35 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The entrance is through a lobby into a reception hall, which is trimmed with oak. It has a paneled wainscoting and ceiling beams, and also an ornamental staircase turned out of oak, with newels, posts, balusters, and rail. A bay window with latticed windows is thrown out at second landing. The hall also contains a paneled seat and an open fireplace, with tiled hearth and facings, and a mantel of oak with columns. The lavatory is conveniently located. The parlor is treated with yellow walls and ivory white trimmings. The dining-room is trimmed with oak, and it contains a paneled wainscoting and a beamed ceiling. The butler's pantry is trimmed with ash, and it contains a bowl, dressers, drawers, and cupboards. The kitchen is trimmed and wainscoted with yellow pine, finished natural with hard oil, and fitted up with the best modern fixtures. The second floor is trimmed with ash and cherry. It contains four bedrooms, with large closets and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $5,000 complete, including furnace, etc. Messrs. J. D. & W. H. McKnight, architects, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT NEWARK, N. J.

WE present as the subject for colors, and also on pages 79, 82, 83, in this issue, a residence which has been erected for Robert W. Cummings, Esq., at Mt. Prospect Avenue, Newark, N. J. The building is treated in a modified and modernized adaptation of the best features of the Old English Colonial style of architecture. The outlines are rather severe, but they are sufficiently broken by the large open windows with ornamental caps of dressed stone, and the massive frieze and cornice which surrounds the building, giving it an expression, and relieving it from its severity. Its massiveness, as shown in the engraving, is very unusual in buildings of this character, but it is so artistically rendered as to present a stately and dignified appearance. The relation of the solid wings to the more open recessed centre is most happy, and the whole treatment of both wings and centre in relation to each other and to the flanking walls is excellent The entrance doorway, with its fluted columns of stone with Ionic capitals on either side of a massive mahogany door, is an excellent feature. Another feature which is worthy of mention is the broad, spacious terrace which surrounds the building, and is reached at the front by a flight of stone steps. These stone steps and underpinning are built of pink granite, beautiful in its shading from pink to white, and which is in harmony with the superstructure constructed of Harvard brick with rough faces, blue gray, and red in color, with mottled effect. The trimmings are of Indiana limestone of a soft gray color. The roof is covered with shingles and left to weather finish a natural silvery gray color. Dimensions: Front 108 ft.; side, 53 ft., not including terrace. The entrance is into a large vestibule with paneled walls and ceilings, which are treated with ivory white. The doors are of San Domingo mahogany. The great hall which occupies the central portion of the house is treated in the Old English Colonial style. There is a paneled wainscoting two and a half feet in height. The pilasters in hall are cased and paneled, and they rise up and are carried over across the ceiling, forming deep square panels, which are heavily moulded. The walls are decorated in red and white, and are in harmony with the woodwork, which is treated in ivory white. The large open fireplace, with its inner facings and hearth of Harvard brick, is furnished with facings and hearth of Numidian marble, and a mantel of Colonial design rising up to ceiling. The grand, broad staircase which sweeps gracefully up from front hall, and at the left of entrance, is provided with a massive newel post, with turned balusters of ornamental design (every third one being of a different design), and the whole finished with a mahogany rail. The drawing-room is treated also in the Old English style of architecture of the elaborated Colonial order. The wall space is divided between the openings, and is paneled from floor to ceiling, and finished at the intersection of wall and ceiling with an elaborate carved cornice. The woodwork in this apartment is treated with old ivory white with excellent effect. The large open fireplace has facings and hearth of Pavonazza marble, and a handsomely carved mantel, with paneled over-mantel rising to ceiling. The library, which has been utilized for a billiard-room, is trimmed with cherry. It has deep windows, seats, an oak floor, circular archways, with pilasters, with caps at spring of arch, and a wood cornice.

The fireplace, of handsome design, has facings and hearth of red Numidian marble, and a mantel rising to ceiling, with carvings, and over-mantel in one large panel. The den is treated in the old Colonial style, and is provided with bookcases built in, and an open fireplace, trimmed with Numidian marble, and a mantel of Colonial style, with carvings. The color scheme is ivory white and yellow. The dining-room is treated in the Old English style. It is trimmed with San Domingo mahogany, and is provided with a paneled wainscoting, above which the walls are covered with leather, put on and held in place by copper-headed nails. The ceiling is heavily beamed and paneled. The color scheme is golden brown and dull red. The fireplace has facings and hearth of Belgian blue marble, and a massive mantel of mahogany, elegantly carved. The rear hall and kitchen and its apartments are arranged in a most complete manner, and are furnished with all the best modern conveniences. The woodwork on second floor is treated in white, while the walls of each apartment are treated in colors, forming a separate color scheme for each room. The fireplaces on this floor are handsomely trimmed. The hall has paneled wainscoting same as lower hall. This floor contains a suite of apartments consisting of two bedrooms, boudoir, and bathroom, guest chamber with dressing-room, children's room, and a large bedroom over dining-room which is used as a nursery, besides the rear stairway, hall, and bath. Both bathrooms are paved with pure white unglazed tiles, and wainscotings of white enameled tiles to the height of four feet six inches. These bathrooms are furnished with Roman shape porcelain bathtubs, pure white marble lavatories, and other fixtures complete. The stairway at rear leads up to third floor, which contains the servants' bedrooms and ample storage. A cemented cellar contains the laundry, heating plant, and numerous apartments necessary for a well appointed house. Messrs. McKim, Mead & White, architects, 160 Fifth Avenue, New York.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A STABLE AT NEWARK, N. J.

We present on page 84 in this issue a modern stable and carriage house, which has been erected for Robert W. Cummings, Esq., at Mt. Prospect Avenue, Newark, N. J. The building is designed and built in an excellent manner, and in harmony with the residence of Mr. Cummings, which we present on page 82 of this issue. The exterior walls are built of Harvard brick with rough faces, blue, gray, and red in colors, with mottled effect, laid up in white mortar. The second story is beamed and paneled, with the spaces filled in with rough plaster, colored yellow; the beams are stained a dark umber. The roof is covered with shingles and finished natural. The carriage-room and stable are most complete in their arrangement. The floors are laid with granolithic, marked off in small squares. The carriage-room walls and ceilings are ceiled up with yellow pine in narrow widths, and finished with hard oil. The carriage wash is graded and laid to drain. The harness closet is ceiled up in a similar manner, and is fitted up with closet, with sliding glass doors, and the usual iron fixtures. The walls of the stable are of brick; the ends of stalls are faced with white glazed brick as wainscot to the height of five feet. This stable contains two box stalls and four single stalls, with the usual ornamental iron fixtures complete. There are feed chutes and hay pockets from second floor to stable. A private hall and stairway lead to second floor, which contains the man's apartments, consisting of four rooms and bath complete. There is also ample storage room for hay and feed. Messrs. McKim, Mead & White, architects, No. 160 Fifth Avenue, New York City, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN RESIDENCE AT WORCESTER, MASS.

The house which we illustrate on page 87 has been erected for Mr. N. S. Liscomb, at Worcester, Mass. It is a picturesque design, with well-broken roof lines, and its prominent location at the crown of a hill, with the ground sloping away rapidly toward the rear, presents an opportunity for effective treatment on all sides. The basement walls are built of light granite rubble work. The first story is clapboarded, and the second story and gables shingled. The color scheme is light bluish gray for the clapboards, with a slightly darker gray for the wall shingles, and a moss green stained roof. The trimmings are ivory white. The dimensions are: Front, 34 ft. 6 in.; side, 35 ft. 6 in., not including projections or veranda. The heights of the ceilings are: Basement, 9 ft.; first story, 8 ft. 9 in.; second story, 8 ft. 3 in.; attic, 8 ft. The hall and octagonal shaped library, separated by a wood grille partition with elliptical arched heads, combine to form a very pleasing effect, and the library fireplace, with its Roman brick facings and elaborate mantel, and the main stairs, paneled at the sides, add to the attractiveness of the rooms. Both rooms are finished in red birch with wainscot cap and cornice, and the walls are hung with dark blue burlap. The parlor is finished in white enamel. The dining-room is finished in quartered oak, and is provided with a paneled bay window seat, with wide stools at the corners for flowers, and a built-in china case. A door opens from the dining-room on to an open balcony. The kitchen, pantries, and rear stairs are finished in North Carolina pine, with birch floors. The second story is finished throughout in cypress, with birch floors, and is very conveniently and compactly arranged. The chambers are all corner rooms of ample size, and the octagonal shaped chamber in the tower, with its accompanying dressing-room and tiled fireplace, is very attractive. The bath-room is conveniently located, is wainscoted with oak, and the open plumbing throughout is first class. It is furnished with porcelain fixtures. The attic is finished in North Carolina pine, with hard pine floors, and it contains two chambers, and a spacious playroom for the children. The basement is entirely above ground, except in front, which is occupied by the heated cellar, and contains the laundry, connected with each floor by a soiled clothes chute, and a well-lighted billiard-room. The billiard-room is finished in cypress, with hard pine floor and a high wainscoting, and is provided with a spacious fireplace, laid up in red brick. Cost, $5,800 complete. Mr. Lucius W. Briggs, architect, 452 Main Street, Worcester, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A PAIR OF TWIN HOUSES AT OVERBROOK FARMS, PA.

We present on page 88, in this issue, a pair of twin houses which have been erected for Messrs. Wendell and Smith, at Overbrook Farms, Pa. The design is treated in a most excellent manner, with an English Gothic feeling, and, while no effort has been made to follow strictly any one style, an attempt has been made to make a picturesque and interesting arrangement of masses. The building is built of local rock-faced gray stone, with limestone trimmings, heads, sills, etc. The front gables are raised by a steep tiled arrangement of the stonework, the courses running edgewise to the slant of the roof. The side gables are covered with shingles. The roofs are also shingled. Dimensions: Front, including both houses, 75 ft. 2 in.; side, 66 ft. 3 in., not including piazzas. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. Both houses are trimmed alike, so a description of one will suffice for the other. The plan is most excellent, and the various apartments are so arranged as to be well provided with light and ventilation. The vestibule is paneled in oak, and provided with a mosaic tiled floor. The hall is trimmed with oak, and it is furnished with paneled wainscotings and massive ceiling beams. It contains an ornamental staircase, with massive newels, posts, balusters, and rail, and is lighted effectively by leaded glass windows. The reception hall in one house is handsomely fitted up with paneled seats and arches, with columns and spindle transoms. The fireplace in hall is built of brick, with facings and hearth of tile, and a mantel made from a special design. The parlor is trimmed with white pine and treated with white and gold, and it is furnished with an open fireplace, with tiled facings and hearth, and mantel to correspond with trim. The dining-room is trimmed with oak, and it has a paneled wainscoting and ceiling beams. The butler's pantry is trimmed with North Carolina pine, and is fitted up with drawers, cupboards, shelves, and sink complete. The kitchen is trimmed and wainscoted with North Carolina pine and finished natural. It is furnished with all the best modern improvements. The laundry is trimmed in a similar manner, and is fitted up with three soapstone trays. The second floor is trimmed with white pine treated in colors, and it contains four large bedrooms, with well fitted up closets and bathroom; the latter is wainscoted and paved with tiles, and is furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms, a den with fireplace, and ample storage room. A cemented cellar contains furnace room, storage, and other necessary apartments. Mr. William L. Price, of 731 Walnut Street, Philadelphia, Pa., was the architect.

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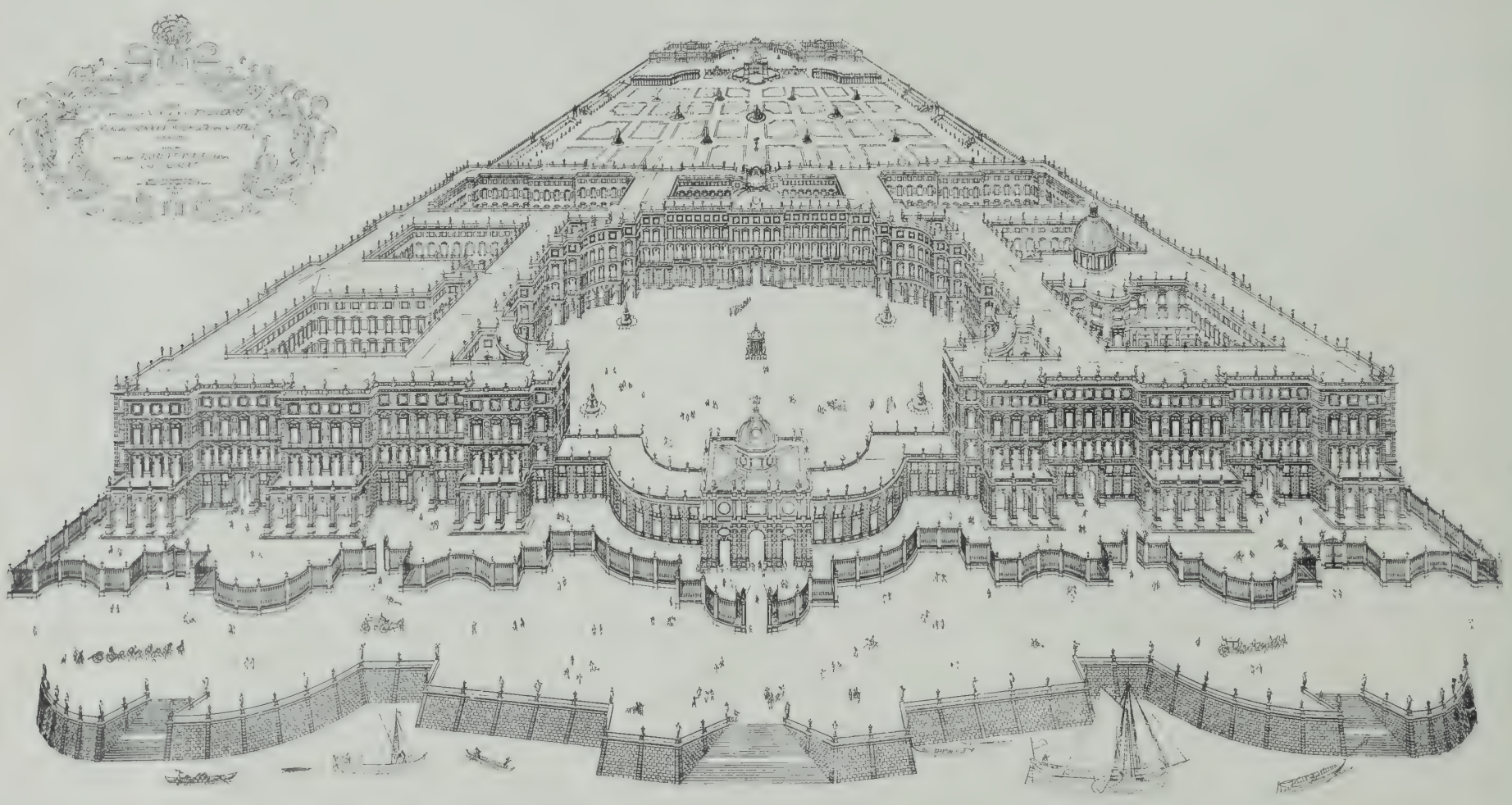


PLAN OF PALACE DRAWN FOR ELECTOR JOHANN WILHELM VON JÜLICH-BERG.—See page 95.

COUNT MATTHÆUS ALBERTI'S PLAN FOR A PALACE IN DÜSSELDORF.

THE Historical Museum of Düsseldorf, which has just been moved from its old home in the former Electoral Gallery Building to its new quarters, possesses, among the plans and views connected with the history of Düsseldorf, a most important plan of a palace of truly remarkable proportions. The drawing is 10 feet 11 inches broad and 7 feet 6 inches high, and was made on separate sheets of paper, which were glued on another thickness of paper, and as early as the eighteenth century it was mounted on linen and secured at the top and bottom to wooden rods, for the sake of preservation. The roll finally found its way to the Government Plan Room, from which it passed to the city, which framed it and gave it a place of honor in the Historical Museum. The plan suffered greatly from careless handling, dust, vermin, and dampness; the paper was sprung, the India ink had faded, and the greater part of the perspective had disappeared or only faint traces of it were left. As it was considered important to preserve this unique document at any cost, and the preservation of the original presented almost insurmountable difficulties, the curator applied to the Minister of Public Works on January 31, 1897, with the request that the plan should be examined by a member of the Akademie des Bauwesens, and by order of the Minister the original was carefully examined by Ober-Baurath Adler, who handed in a report in October of the same year, advising that the original should not be retouched or redrawn on account of the bad condition of the document and of the danger that mistakes might be made which it would be impossible to remedy, but he did advise that an exact photograph should be made in the size of the original, completing the missing outlines by means of tracings. The project had to be postponed on account of the great expense involved, but in 1896 the Minister declared himself ready to provide the sum of 8575, if the Province of the Rhine would furnish an equal amount, and finally the reproduction was undertaken by the architect Laxmann, under the direction of Baurath Grunert. In the spring of 1898 the original and the copy were on exhibition in Berlin, but in the following summer both were returned to the Düsseldorf Museum.

Our engraving gives a bird's-eye view of the plan. The original was drawn in India ink, the figure and ornamental parts being done in freehand drawing. It is the plan of a palace that the Elector, Johann Wilhelm von Jülich-Berg (1690–1716) wished to build in the New City which was founded by him on the banks of the Rhine, above the old Franciscan Church and the Citadel. The Elector enlarged the fortress planned by Wolfgang Wilhelm, and intended to inclose the outworks, ditches, etc., by a wall, and then, as a crowning of the whole, he expected to build this new palace, to which he would transfer his residence.

The plan must have been prepared about 1709, and it seems that its very immensity frightened those who should have appropriated the necessary funds for its construction, for as early as the following year it appears to have been laid aside, and the Elector was devoting himself to the erection of his Bensberg Palace; with his death in 1716 the project was entirely abandoned.

The plan was the work of Count Matthæus Alberti, a native of Venice and Oberbaudirektor, for the Elector, whose chief assistant and draughtsman was the Venetian, Aloysius Bartolus. The Bensberg Palace, which was constructed under the direction of Count Alberti, must have compensated somewhat for the abandonment of the other plan. The latter would have covered a surface 820 feet broad by 1,312 deep, and the buildings would have been more than four times as large as those of the royal palace in Berlin. Besides, there were the pleasure gardens in the style of André Lenôtre, with terraces, fountains, summer-houses, etc. This unity and symmetry of the plan place it among the very best of that time, and the conception was on a larger scale than all other palace plans of the seventeenth and eighteenth centuries together. If this palace had been built, Düsseldorf would not only have been a little Versailles, but it would have possessed the most gigantic and most beautiful royal residence of the entire century.—PAUL CLEMEN, in Zeitschrift für Bauwesen.

A COLONIAL RESIDENCE AT NEW HAVEN, CONN.

THE engravings shown on page 92 illustrate a residence which has been recently completed for Prof. George B. Adams, at Edgehill Road, New Haven, Conn. The building is constructed in the Colonial style, and, although the plan of the house is a rectangle, the good proportions and interesting effects are obtained by the harmonizing of the different features and the strict adherence to pure and simple detail. The underpinning is constructed of rock-faced East Haven red sandstone. The building above is covered with sheathing, paper, and then clapboards, and painted ivory white. Blinds painted bottle green. The roof is covered with cedar shingles, put on unstained and left to color with the weather. Dimensions: Front, 40 ft.; side, 35 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 9 ft. 6 in.; second, 9 ft.; third, 9 ft. The interior arrangement is most conveniently planned, and is devoid of any waste room. The front entrance opens into a hall, which is connected by sliding doors with the reception and dining-rooms, and also through the reception-room into the sitting-room, so that all the rooms can be thrown into one for use at a reception or entertainment. These rooms are finished in cream white, and floored with quartered white oak finished in wax. Another good feature about the plan is the isolation of the kitchen from the main rooms of the house, and which is provided with a large vent flue, so that the kitchen odors are confined to that part of the house. This kitchen is also provided with a lobby, large enough to admit ice box, a large well fitted up pantry. The staircase in front hall, which is built of quartered white oak, leads up into a hall in the second story, which is so arranged that all rooms open directly from it. This staircase is an ornamental one, and it has turned newel posts, balusters, and rail. The sitting-room contains an open fireplace, trimmed with tiled hearth and facings, and a mantel of oak, with a paneled seat sweeping around from same. The second floor contains four bedrooms, two dressing-rooms, large closets, and bathroom. Two of the bedrooms lead out through French casement windows on to a large balcony. The bathroom is fitted up with a porcelain lined iron bath, closet, and bowl of the most sanitary design. The entire second floor is trimmed with whitewood painted in colors, and the floors are laid with narrow Georgia pine. The third floor contains two bedrooms and ample storage, and more bedrooms if so desired. A cemented cellar contains furnace, laundry, and other necessary rooms. Cost, about $5,000. Mr. L. W. Robinson, architect, 342 Exchange Building, New Haven, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A DUTCH COLONIAL HOUSE AT FLATBUSH, L. I.

THE engravings shown on page 85 in this issue illustrate a Dutch Colonial house, which has been erected for Mr. John B. Hicks, at Flatbush, L. I. The design is most excellent in its execution and detail, and it combines a most complete arrangement of interior plans. The Dutch gable in front is a striking and novel feature. The underpinning is built of bluestone, with faces left rough as they come from the quarry. The building above is covered on the exterior with sheathing, paper, and shingles, stained a soft grayish green color. The trimmings are painted white. The roof is shingled, and stained in harmony with the body. Dimensions: Front, 34 ft.; side, 45 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The hall is treated in a handsome manner. It is trimmed with ash treated in the Flemish style. It is fitted with paneled wainscoting and ceiling beams. There is also a pleasant nook, and bay window, furnished with paneled seats. The fireplace is furnished with green tile facings and hearth, and a mantel of special design. Cabinets with leaded glass doors are placed at either side of mantel. The staircase is separated from the hall proper by an archway, and is furnished with newel posts, balusters, and rail. The parlor is treated in white enamel, and it contains a false fireplace, with white tile facings and hearth, and a mantel made from special design. The bay window, with seat, forms a pleasant nook. The dining-room is trimmed with ash, and it has a paneled wainscoting and massive ceiling beams. This room is treated in the Dutch style, and it contains an open fireplace, furnished with tiled facings and hearth, and a Dutch mantel. The butler's closet is provided with sink, cupboards, dressers, and closets. The kitchen and pantries, lobby, and closets are trimmed with cypress, and finished natural. These apartments are fitted up in the most approved manner. The kitchen is furnished with an unusual amount of pantry and closet room. The second floor is trimmed with cypress, and it contains four bedrooms, large closets, and bathroom, the latter wainscoted with tiles, and fitted up with porcelain fixtures and exposed nickelplated plumbing. The bedrooms on this floor contain attractive nooks with paneled seats. The third floor contains three bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $5,800, including hot-water heating and everything complete. Mr. John J. Petit, architect, No. 186 Remsen Street, Brooklyn, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

ST. JAMES' CHAPEL, ELBERON, N. J.

WE present, on page 90, in this issue, St. James' Chapel, at Elberon, N. J. St. James' Chapel is well known along the Jersey coast as being the house of worship of some of the most prominent men in this country. As a tribute to a few of its worshipers who are now deceased, handsome tablets have been erected, including one for the late President Garfield, General Grant, Anthony J. Drexel, and George W. Childs. The building has many excellent features. The underpinning and first story up to window sills are built of brick laid up in red mortar. The building above this is covered with sheathing, paper, and shingles, painted a light brown with reddish brown trimmings. The roof is shingled and finished natural. The interior arrangement is most complete. Entrances are located at either side of nave at front. The interior trim is of yellow pine, stained and finished in cherry. The furniture is turned out of cedar. The ceiling is beamed and paneled. The pulpit and lectern are of ornamental design, and the choir, chancel, and altar, with its robing rooms on either side, are most excellently arranged, and the whole is finished off in a manner becoming the purpose for which it is intended. The windows are glazed with delicate tinted glass, and they shed a soft pleasant light over the whole edifice.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

Efflorescence.

EFFLORESCENCE, whitewashing, or petreing, as it is variously called, which is such a frequent source of trouble, does not appear to be generally understood or the causes of it known, if we may judge from the frequent questions and discussions of the subject. Contractors are sometimes required to use stone "free from nitre," for some kinds of natural building stone will effloresce worse than any brick. We doubt that the efflorescence on stone is a nitrate, though we have never examined this. Of the samples of efflorescence on brick that have come into our possession not one was a nitrate, but all were sulphates. From a notice in Dingler's Polytechnisches Journal, it appears that a German investigator, Hans Gunther, has made a series of exhaustive experiments, and concludes that efflorescence on brick may come:

1. From matter contained in the raw clay.
2. Matter introduced by means of water used in the process of manufacture.
3. Formed during burning by the residue, or ashes, of the coal, from the pyrites (iron sulphide) in the coal, or pyrites in the clay.

Outside any of these causes, efflorescence may result from the mortar, by infiltration of soluble matter in the brick, or by chemical reaction of the alkalies of the mortar with the gypsum of the brick. The soluble salts introduced in the clay by water for tempering, or by the water with which mortar is mixed, are not taken into consideration.

As most brick clays themselves contain more or less soluble salts, particularly sulphates, these often show themselves on the surface of the bricks in drying, especially if the drying takes place very slowly, still more so in the kiln during the process of water smoking, if this is not performed properly and the moisture that is driven out of the bricks in one part of the kiln is allowed to came into contact with the cold green bricks in another part of the kiln. This moisture settles upon the bricks and soaks into them, to be driven out again as these bricks, in their turn, become heated. In this way there is a leaching out of the soluble salts, and the bricks become discolored. They are also, sometimes, checked on the surface.

As is well known, the principal source of the formation of soluble salts is the gases from burning coal, and the presence of sulphide in the coal is answerable for this. The sulphurous acid formed in burning the fuel is readily oxidized, in a superabundance of air, into sulphuric acid, and this, on coming into contact with the basic portions of the clay, particularly if it is rich in lime, plentifully forms sulphates. Whether this can only take place, as some believe, in the presence of moisture, as in the water smoking process, or whether it can also occur in the full fire of the burning process, is not determined. Nevertheless, it is certain that when a surplus of air is kept out, that is, by burning in a reducing fire, sulphuric acid cannot be formed. For this reason the present practice of burning in the continuous kiln, with a strong draft, is likely to develop stains and efflorescence, and the more favorable results obtained when burning in the old style of periodic kilns are probably to be explained by the fact that in these kilns there is very often an absence of free air. A peculiar effect of sulphuric acid is the red stains on those bricks which, in consequence of their large contents of lime, would otherwise burn yellow. The formation of the light colored silicate of iron and lime is prevented, through the sulphuric acid formed, the fuel gases laying hold of the lime.

According to Gunther, the presence of sulphide in the fuel is not answerable for efflorescence to anything like the extent that the presence of sulphide is in the clay itself, inasmuch as the sulphuric acid formed in the interior of the brick seizes upon the constituents of the clay. Gunther's many and careful experiments upon clay, which demonstrate this fact, constitute the chief value of his work. For the prevention of efflorescence he is not able to recommend any better remedy than that which is already in practical use: The addition to the clay of a small and suitable quantity of carbonate, or chloride of baryta, or both, for the purpose of converting the soluble salts, such as sulphate of lime, into the insoluble sulphate of baryta.

Location of Hot-Air Registers.

WHAT is the best position in a room or hall to place a hot-air register? The general practice among hot-air heating experts is to place these registers in or near the warmest parts of the room, or close to the inner walls, experience having taught them that the best results in warming the rooms can be attained by this practice. They also avoid running hot-air riser pipes to upper rooms in outside walls, preferring inside for this purpose. There are reasons for this practice that will commend it to heating men. Furnaces are generally placed near the centre of their work, so that the heat can be delivered into the rooms to be warmed with as little loss as possible by friction and condensation in the hot-air pipes. This practice places the registers near the inside walls.

Some heating men place registers near windows, giving as their reasons for so doing that by discharging the warm air in the coldest part of the room, and warming it, the inner part of the room must necessarily be kept warm. By doing this they lose sight of the fact that by discharging the warm air under a window the air is cooled quickly, causing descending of cold air in and about the windows, making it very difficult to keep the room heated and at an agreeable temperature. This is avoided by discharging the heated air near the inner walls of the rooms. The ascending air, coming in contact with these walls, which are at a much higher temperature than the outside walls, is not subjected to so rapid a cooling process, consequently it circulates in the room at a more even temperature, and, when cooled by contact with the outside walls, falls with less velocity, flowing through channels provided for ventilation, or by leakage to the outside air.

This short review of hot-air heating practice is suggested after looking over a set of plans lately published by a steam and hot-water heating expert, of a large residence, in which is laid out a system of indirect heating by steam, no direct radiators being used in the building. With three exceptions, all the registers on the first floor are placed close to the outside walls, and near or under windows, the exceptions being in halls where there are no outside walls. The hot-air risers to the second floor are run up in outside walls, with two exceptions, and these are in inside walls for the reason that they could not be placed in an outside wall.

I can understand the desirability of placing direct radiators against outside walls or under windows, the proper position for them, but why should the hot air from indirect radiators be delivered near or under a window? If it is bad practice to do so with hot air from a furnace, it must also be bad practice from an indirect steam or hot-water radiator, and, when installed in this manner, the radiator should be considerably enlarged over what would be required were the registers placed in the warmest sides of the rooms, in order to make up for the great loss by rapid cooling of the air coming so quickly in contact with the cold surfaces.

Running the hot-air stacks to upper floors in outside walls is also an error, even if they are wrapped with non-conducting material. All outside walls are cold, and extremely cold, at the time when the most heat is required. The wrapping placed on these pipes will, to a certain extent, repel the cold. But how much better to place them in a wall that is not exposed to the cold, when the air can be conveyed to the rooms to be heated with the least loss of temperature possible. Then there is this advantage to be gained: the hot air is delivered in the room at the inner wall, considered by nearly all heating experts the position to gain the best results.

The plan of the indirect system referred to shows a defect in that it is spread all around the outer wall in the basement, not only being contrary to best heating practice to derive the best results, but spoiling the basement by filling it up with an endless display of indirect stacks, cold-air ducts and pipes, when, if the principle observed by furnace heating men was carried out, and the plant concentrated, and the inside walls used to convey the heated air to the rooms above, a more efficient and compact heating system would have been attained.

This is the way it looks to a furnace man who cannot see why there should be any different practice in placing hot-air registers when the air is heated by coming in contact with steam radiators, from what is the usual practice of the furnace hot-air expert.—Domestic Engineering.

Ventilation and Warming of Churches.

THE ventilation of churches in which the worshipers are packed with an irreducible minimum of floor space, which no excess of height can compensate, is notoriously defective, and, indeed, is worse in proportion to the thoroughness of the heating, since the higher the temperature within the building the more carefully are cold draughts excluded, and, were congregations generally composed of the class of persons who throng the police and county courts, the state of the atmosphere at the close of the service would be well-nigh intolerably offensive. We, therefore, have read with interest the description of a new departure in the system of combined warming and ventilation introduced by Prof. H. Fischer, the well-known heating engineer, in the new memorial church at Berlin, which in its general plan resembles St. Paul's Cathedral in London, though of smaller dimensions, the height of the nave and transept being 82 ft., and of the dome 237 ft., the corresponding measurements in St. Paul's being 100 feet and 360 feet respectively. To the height of 80 feet from the floor the walls are traversed by hot-air chambers, so that from the ground to the galleries 22 feet above there is no perceptible difference of temperature, the air being kept constantly at 15 degrees Centigrade (60 degrees Fahrenheit). The aim of the engineer has been the removal from the space occupied by the congregation of the paths followed by the currents of air conveying the warmth from the sources of heat to the radiating surfaces, by placing the heating apparatus high up in the neighborhood of the cooling surfaces, maintaining, in reversal of the usual procedure, a higher temperature in the upper portion of the building, and intercepting and reheating the cooled air in its descent toward the lower part occupied by the congregation. There are thus four strata of air of different temperatures. On the ground floor and in the galleries there are very few coils, but along the first entablature, at a height of 95 feet, they are sufficiently numerous to counteract the loss of heat through the walls, which are there no longer traversed by hot-air channels, and to maintain from this level to that of the second entablature at a height of 145 feet, or 50 feet above the first, a temperature a few degrees Centigrade higher than that in the parts below. Other coils are fixed above the second entablature and in the lantern of the dome. To avoid the dangerously chilling draughts that would follow the opening of the doors in the intense cold of a Prussian winter, the entrances are provided with double-swing doors and coils placed in the intervening passage. Professor Fischer maintains that the system of heating the upper more than the lower regions of the air is the only proper course in such lofty buildings as churches; for, whereas with the ordinary method the air heated on or below the ground level is cooled on reaching the roof, and, fouled by the products of respiration, descends again on to the heads of the congregation, unless withdrawn by some such exhausting arrangement as is carried out in our Houses of Parliament, in his system the fresh air is warmed to an agreeable temperature in its passage through the channels in the walls, and its ascent is favored by the coils between the first and second entablatures; those in the dome, although they do not contribute to the warming of the parts occupied by the worshipers, serve effectually to prevent the descent of the foul air by securing its continued ascent toward, and escape through, the apertures in the lantern that crowns the edifice."—The Lancet.

Mouldings.

BY examining antique mouldings, it will be found that in all the profiles the cyma and the cavetto are always used as finishings, and never applied when strength is required; that the ovolo and talon are always employed as supporters to the essential members of the composition, such as the modillions, dentels, and corona; that the chief use of the torus and astragal is to fortify the tops and bottoms of columns, and sometimes of pedestals, when they are frequently cut in the form of ropes; and that the scotia is employed only to separate the members of bases, for which purpose the fillet is also used, not only in bases, but in all kinds of profiles. An assemblage of essential parts and mouldings is termed a profile, and on the choice, disposition and proportion of these depends the beauty or deformity of the profile. The most perfect are such as are composed of few mouldings, varied both in form and size, fitly applied with regard to their uses, and so displayed that the straight and curved ones succeed each other alternately. On every profile there should be a predominant member, to which all the others ought to be subservient, and seem either made to support, or to shelter it from the injury of the weather; as in a cornice, when the corona is principal, the cyma or cavetto covers it, and the modillions, dentels, ovolo, and talon support it. When ornaments are employed to adorn the mouldings, some of them should be left plain in order to form a proper repose, for when all are enriched the figure of the profile is lost. In a cornice the corona should not be ornamental, nor the modillion band; neither should the different fasciæ of architraves, the plinths of columns, fillets, nor scarce any square number, be carved, for they are, generally speaking, either principal in the composition or used as boundaries to other parts, in either of which cases their figures should be distinct and unembarrassed. The dentel band should remain uncut when the ovolo and talon immediately above and below it are enriched; for when the dentels are marked, particularly if they be small, the three members are confounded together, and, being covered with ornament, are much too rich for the rest of the composition—a fault carefully to be avoided, as the just and equal distribution of enrichments is on all occasions to be attended to. For, in effect, the articles of sculpture in architecture are like diamonds in a lady's dress, with which it would be absurd to cover her face and other parts that are in themselves beautiful. When mouldings of the same form and size are employed in one profile, they should be enriched with the same kind of ornaments. It must be observed that all the ornaments of mouldings are to be regularly disposed, and answering perpendicularly above each other; the middles of the modillions, dentels, oves, and other ornaments all in a line, for nothing is more confused and unseemly than to distribute them without any kind of order. The larger parts are to regulate the smaller; all the ornaments in the entablature are to be governed by the modillions or mutules, and these are to be dependent on intervals of the columns, and so disposed that one of them may correspond with the axis of each column. It is further to be observed that the ornaments must partake of the character of the order which they enrich, and those used in the Doric and Ionic orders must be of a simpler kind and grosser make than those employed in the Composite and Corinthian.—Architect, London.

New Uses of Crushed Stone.

ONE of the noticeable things of recent years is the greatly increased use of crushed stone for building purposes. Ten or fifteen years ago very little demand existed for broken stone outside the requirements of railroad ballast and road making. Once in a while came a demand for broken stone for concreting a foundation for a bridge or for bedding engines and heavy machinery in mills and factories.

For building purposes there was practically no demand whatever. The custom was to lay down broad footing courses or large stone, and on these to erect the wall, and this is still the custom with all ordinary sized buildings.

With the advent of the twelve and fifteen story "sky-scraper," however, a totally different plan has become the fashion. After the excavations have been made, heavy steel beams or old rails are laid down, and the spaces filled in with a concrete mixture of broken stone, cement, and sand. This in a short time solidifies into a rigid mass of enormous strength, and the result is a footing course of practically a single great stone to bear the weight of the great steel structure to be erected upon it. The builders and architects of Chicago are entitled to the credit of introducing this system, the soft nature of the ground and the vast size of the buildings necessitating a construction of the kind.

The results were so superior to the old-fashioned way that the plan was speedily taken up in other cities, and to-day there is a scarcely a great building in any of the large cities which does not rest on a concrete mass. The beautiful Park Building of this city is a notable example, there being a solid mass of concrete supporting it containing over 1,000 tons of crushed limestone.

Another use for crushed stone (new in this country, but old in Europe) is for concrete arches for bridges. The writer is informed that one of the alternative plans for the two new bridges for Schenley Park calls for concrete arches—the process being to build a wooden false work the shape of the arch of the bridge, and fill this in with concrete made of broken stone, cement, and sand on certain specified proportions. Such a system of construction will doubtless prove a novelty to many Pittsburg builders, but in England and Germany such structures are becoming numerous.—Journal of Building.

Stable Subsoil for Foundations.

INVESTIGATIONS preliminary to the foundations of a large building are seldom made with sufficient thoroughness. Our readers doubtless will recall the famous epitaph on the tombstone of an architect who was buried in Westminster, which reads:

> 'Lie heavy on him, Earth:
> He laid great loads on thee."

The amount of the loads arising from a great building, and their effect upon not only the immediate soil, but upon the subsoil, is often more considerable than we are aware of. Furthermore, even with the best of soil the conditions are sometimes such as require especial provisions to guard against trouble. Some years ago an apartment house of considerable size was in process of erection in Brooklyn, upon a street in a newly developed portion of the city which had been laid out over a line of low mounds or hillocks, the streets having being cut down very nearly to a level, so that the finished grade was only a short distance above the bedrock, and the foundations of the building were even closer to the substratum. The earth in this case was of a clayey nature, and after an unusually heavy rain, which was allowed to soak in around the foundations and get down through to the rock, the whole structure, building, foundations, clay bottom, and all, proceeded to slide down hill, and finally ended by landing in a heap in the middle of the street.

There is a great deal more movement of this sort than people are aware of. It has been stated on excellent authority that the whole southerly slope of Beacon Hill, Boston, with the buildings upon it, has been gradually sliding down into the water at a rate which is only a few inches a century, but yet quite sufficient to be appreciable; and as the section which it is alleged is in process of transit is occupied at points by some of the heaviest structures in the city, it may sometime become a question as to how far this species of loading can be safely carried when imposed, as in this instance, upon a sloping substratum of rock. In the more recent New York tall

buildings it has been the custom to assume that the soil was worthless to resist the loads, and the foundations have accordingly been carried clear down to the bedrock. In Chicago, on the other hand, most of the large buildings are floated upon a relatively thin and by no means very firm layer of alluvial deposit. The Chicago buildings settle a good deal, the average Boston building settles slightly, and usually unequally, while the more recent New York buildings do not settle at all. The latter is obviously the best result, though also the most expensive. —Brickbuilder.

Plaster in Fire-Proof Buildings.

SOME time ago the National Board of Fire Underwriters issued a report, giving reliable and more copious statistics than were ever done before of the loss by fire in this country and abroad. It was found difficult, even with the co-operation of the State Department at Washington, to obtain this information. A committee on statistics was appointed by the board, and it is due to their persistent efforts that these valuable data have been collected:

"Of the excessive loss by fire in this country the report says: 'The destruction cannot be checked without the support of the assured, and to obtain such assistance every citizen should realize the extent of the fearful fire waste in the United States, how much of a tax and a burden it is upon his energies and industry, and how much of it is easily avoidable if he will join with his underwriters to stop it. Nor do we claim to have done our full duty in the premises, until we shall have ourselves used the means within our control to obtain the data so essential for our own instruction and guidance.'"

Of the comparative statistics given perhaps the most instructive are those of the per capita losses. The following table, compiled from the report, gives a comparison of some of the chief foreign cities with those of the leading cities of the United States:

Paris	1889	2,424,705	.44	.37
"	1890	———	.43	.76
Berlin	1890	1,533,637	2.55	.22
St. Petersburg	1891	1,000,000	.57	.59
Hamburg	1890	580,000	1.17	.25
Glasgow	1891	546,968	.88	.03
Buenos Ayres	1888	525,000	.13	.81
Marseilles	1890	406,919	1.13	.54
Leeds	1891	367,506	.75	.32
Sheffield	1890	324,243	.29	.14
*Turin	——	315,000	.88	.006
Dublin	1890	254,707	1.36	.21
	Foreign average loss			.354
New York	1891	1,800,000	2.08	3.86
"	1892	———	2.24	2.81
Chicago	1891	1,099,133	2.68	2.44
Brooklyn	1891	850,000	1.68	1.89
St. Louis	1891	542,922	2.42	5.00
Boston	1890	448,477	1.17	2.42
"	1891	———	1.78	3.37
"	1892	———	1.67	1.89
Baltimore	1890	480,000	1.09	6.52
"	1891	———	.89	6.22
"	1892	———	2.40	3.00
	American average loss			3.58

*Annual average for five years.

It will be observed that the minimum loss in the American cities is more than twice as much as the maximum loss of the cities abroad, and that the average foreign loss is only a little more than one-tenth the average reported in the great cities of this country. The extent of the enormous fire waste in the United States is thus prominently exposed in the strong light of official statistics —The National Builder.

Practical Uses of Plaster of Paris.

FEW people have any idea what a valuable material plaster of paris is, and how it enters into the things of every-day life about us, from the hard finish on the wall to the lamp collar which is fastened with it.

It is found in a raw state in almost every land, and is made of what is called gypsum rock (a sulphate of lime). It is quarried, calcined, ground to various degrees of fineness, and then recalcined or boiled in huge caldrons, and is then fit for use. The best is made mostly in New York, from rock quarried at Nova Scotia, and is the kind used by dentists, and for all sorts of fine castings. We get another grade from Michigan, sometimes called by the trade blue plaster, on account of a blue cast in it. This kind is used mostly for hard finishing of walls. Another grade, coarser plaster, comes from Iowa, which has been used extensively for what is called "stucco plastering," in which a mortar is made of one part of plaster to two of sand, and enough glue size to keep it from setting too quick. It makes one of the hardest kinds of wall, but it can be attempted only by the most skilled mechanics.

Plaster in setting can be retarded or accelerated by the use of various ingredients. Glue size is the best for retarding, as it makes it materially harder after it is dry. Sugar, molasses, and cream of tartar can be used for the same purpose. Cream of tartar is dangerous to use, as a little too much will kill the plaster from setting entirely. Two of the best things to use in making plaster set quick are common salt or alum.

Plaster that has been kept a long time and has gathered moisture, or that has been set in a damp place, will also set quick. This can be remedied by removing any lumps that may have formed and heating it on a stove in some metal vessel. When heated, it will appear to boil like a liquid.

Ground, uncalcined plaster is used extensively to improve what are called sour lands.

Plaster in setting heats slightly, which causes it to expand. An eminent authority claims that this expansion will cause it to fill the crevices of a mold. But this is a mistake, as the expansion does not take place until it is quite hard.

Plaster is calcined at a temperature of 212 to 258 degrees, and a heat of 400 degrees Fahrenheit will reduce it to a soft chalk.

Plaster, when dry, treated with two coats of warm boiled oil, will, when painted, stand the elements as well as wood. Rogers' statuary is made in this manner. Shellac varnish is used sometimes in place of boiled oil, but if there is any common lime in the work it is apt to scale.—The National Builder.

Fire Protection of Tall Buildings.

IT will be remembered that, when the upper eight stories of the Home Life Building were burned out in the recent fire, the chief of the New York Fire Department stated that the failure of the firemen to do any effective work above the ninth story was what he had predicted whenever one of these tall buildings came to be tested by a serious fire. There is a limit of height above which the ordinary methods of fire-fighting by pumping water through a hose are inadequate. Much valuable time is lost in dragging the hose from floor to floor; it is always liable to injury from fire or falling debris; and, of course, there is the danger of bursting from overpressure, a risk that naturally increases when the water has to be forced to the upper floors of a twenty-story building.

The New York Fire Department has recently made a test of the height at which an effective stream of water can be delivered from its engines, which shows that our tall buildings are better protected than is generally supposed. A fire engine was connected to the mains and to a standpipe that extends the full height of the St. Paul Building, and succeeded in forcing a considerable stream of water from the roof—at a height of 307 feet above the street level. With a pressure of 180 pounds at the engine, the water was thrown over St. Paul's Church, on the opposite side of Broadway, and fell into the churchyard beyond, a horizontal distance of about 250 feet. Unfortunately, the failure of one of the couplings on the standpipe within the building prevented the test being made with the maximum pressure at the engine of 300 pounds to the square inch; but enough was done to prove that the engines of the department can deliver water at a satisfactory pressure on any of the floors of our tall buildings. At the time the standpipe failed the engine was throwing over 250 gallons a minute at a height of over 300 feet, with only 60 per cent. of the maximum pressure.

While it is true that the tall buildings are provided with their own fire service in the shape of tanks on the roof or special fire pumps in the basement, experience has shown that the system is not very reliable. The tanks are liable to be empty, or the pumps may not be available because of insufficient steam supply in the boilers, or the whole plant may be crippled by the flooding of the basement during the progress of a fire. But by the new system, if a fire should break out in a building supplied with adequate standpipes and a good elevator service, the firemen will be enabled to command a good service of water on any of the highest floors within a few minutes after reaching the scene of the fire.

The failure of the standpipe in the St. Paul building suggests that the fire system of these tall structures should be put in under the rigid inspection of the Building Department; that it should be of ample capacity; and that it should not be passed by the Department until it has been subjected to a test pressure considerably beyond that which will obtain in actual service.

A further development of the idea of having the service of these buildings operated by the engines of the Fire Department would be to lay down separate salt water mains at stated intervals from Broadway to the Hudson and East Rivers, with connections at the water front to enable the powerful pumps of the fireboats to be concentrated upon a fire. This system is already installed in some Western cities, and it provides a supply of water far in excess of anything that could be secured by the use of the ordinary fire engines. A combination of both systems and the provision of ample standpipes in every tall building would render these structures practically proof against destruction, so great would be the flood of water that could be let loose upon a fire. It should also be borne in mind that these towering buildings would not only be indestructible themselves, but they would afford an excellent protection against the spread of a conflagration. Their great mass would form an efficient fire-screen, tending to localize an outbreak, while they would serve as giant water-towers, from the upper floors of which a vast amount of water could be thrown upon the burning buildings below.

New Uses of Glass.

EARLY in October, 1898, a paving company of Lyons, France, began laying on the Rue de la République a piece of pavement of ceramo-crystal, ceramic stone, or devitrified glass. During the months of November and December of 1898 and thus far in January, 1899, this pavement has been driven over during all hours of the day and night. It has stood as hard usage as any pavement could be subjected to during that time, and is still in an admirable state of preservation. The glass, or ceramic stone, pavement is laid in the form of blocks, eight inches square, each block containing sixteen parts in the form of checkers. These blocks are so closely fitted together that water cannot pass between them, and the whole pavement looks like one large checkerboard. Like all thoroughfares in France, the roadbed slopes gently to the walk on each side. Some of the edges of the checkers have been broken off during their three months' service. United States Consul Covert counted some twenty of them that have been slightly chipped on the edges. It is contended that this does not argue against the value of the material as a pavement, and that any kind of stone would have suffered just as much or more in the same time.

Mr. Covert visited the Ceramo-Crystal Manufacturing Company's works at the suburban village of Demi-Lune, about six miles from Lyons. The factories cover nearly 8,000 square yards of ground. Work is now stopped in them while additions are being made to the buildings in the shape of second stories. In the yards are many tons of broken bottles, which the superintendent told me was their "raw material." On the four sides of a large brick smokestack are specimens of ceramo-crystal for buildings and interior decoration, some of the pieces as smooth as highly polished marble, others being rough, like cut stone, and still others having a surface like common brick.

The advantages attributed to this ceramo-crystal by the manufacturers are: As a pavement, it has a greater resistance than stone; it is a poor conductor of heat, and ice will not form upon it readily; dirt will not accumulate upon it as easily as upon stone, and it will not retain microbes; it is more durable than stone and just as cheap. The Central Architectural Society of France made a report recently on this ceramic stone.

This subject is being discussed in the press, and is receiving general consideration. An elaborate and exhaustive article in the Revue des Deux Mondes for November treated the question under the heading of "A Glass House," the writer asserting that a large house constructed entirely of glass would be an attractive feature of the coming World's Exposition in 1900. He said that glass could be used for tubes, pipes, vats, tiles, smokestacks for factories, and for buildings. Double glass walls in a house would admit of the circulation between them of cold or warm air, thus regulating the temperature.

The glass house, or the luminous palace, which it has been decided to build on the grounds of the 1900 Exposition, is now being constructed.

Avoiding Frost in Gas Mains.

IT has heretofore been believed that freezing in gas pipes was due to retained moisture alone, which, under the action of cold, condensed and then froze, obstructing the opening in the pipes. It was thought this difficulty might be overcome by drying the gas by washing with concentrated sulphuric acid. During the past winter, however, it has been shown that, in spite of this precaution, a number of cases of freezing occurred which, after verification, have been attributed to the congealing of benzole. It became necessary, therefore, to seek for another method which would prove efficacious in this instance. This process, patented recently by the Deutsche Continental Gas Gesellschaft of Dessau, is mentioned in the Cosmos, and consists of injecting in the gas at the outlet of the holder a determined quantity of alcohol. If, under the action of the cold, the water and benzole vapors are condensed, the alcohol vapor will act in a similar manner, and the freezing point will be lowered, and the obstruction of the pipes consequently prevented. Experiments made in the course of the past winter have demonstrated that the influence of the alcohol vapors will be felt at a distance of two and a half miles from the gas holder. On the other hand, however, its effect is lost when the gas passes through a wet meter. The inventors advise, therefore, the placing in works, stations, etc., at the meter a small injector, admitting of the introduction anew into the gas of the alcohol vapor. The proportion necessary is 4.7 avoirdupois ounces of 95 deg. alcohol per 1,000 feet of gas, but in case of extreme cold, such as four degrees or five degrees below zero, six or seven ounces may be necessary. The addition of this small quantity has no effect upon either the heating or the illuminating power of the gas.—Progressive Age.

Thomann's Roofing-Tiles.

If the roof of a building is to be durable so that it can resist the action of weather and climate, the material of which it is constructed must be capable of withstanding effects of frost, heat, dampness, and of the chemical action of the vapors and smoke of a large city. Lightness in construction must be considered, so that it shall not be necessary to use timbers of excessive bulk. Nor must neatness of appearance, so important in these days of elaborate ornamentation, be forgotten. These requirements are, perhaps, best met in Thomann's roofing-tiles, made by the American Cement Tile Company, of Detroit, Mich. The tiles in question are made of German Portland cement, sand-pressed in molds, are chemically pure, and are wholly impenetrable by rain, snow, or frost. Ventilating means are also provided, so that the necessary circulation of air can be obtained. Not the least remarkable feature of these tiles is their lightness, a square of roofing (100 square feet) weighing only 700 pounds. When the weight of the roof-boards has been deducted, the tiles weigh less than slate.

Thomann tiles have received medals at the Jubilee Exposition, Weyer, Germany; the Provincial Exposition, Grems, Austria-Hungary, 1893; Charlevoix Exposition, Belgium, 1895; Welz Exposition, Austria, 1895; Leipzig Exposition, Germany, 1898

Windows in Chicago Buildings.

Swinging windows above the second story on all large buildings are required by a building ordinance lately passed in Chicago. The avowed purpose of the new law is the prevention of fatal accidents in window-washing, these accidents being now very frequent. The law says that the windows must swing on horizontal or vertical pivots, or a balcony must be built in front of each window. The law is objected to by architects and builders, who claim that it was passed in the interest of owners of patents of swinging windows. It is also objected that the size of the windows would have to be reduced, owing to wind pressure, and they predict fatal accidents will result from falling window sashes. In a large number of recent high buildings in New York, a staple is secured to each side of every window opening, and the window cleaners wear a stout belt, to each side of which is attached a strap. A suitable clip on the end of each strap enables it to be readily attached to the staples on either side of the window, and the straps have slack enough to permit of the free movement of the window cleaner.

An Old Plumbing Regulation.

In 1365, King Edward III., of England, signed a plumbing ordinance, conferring privileges and legislating for the protection of the mutual interests of both the public and the craft. It was as follows: "That no one of the trade of plumbers shall meddle with works touching the trade except by assent of the best and most skilled men in the said trade; testifying that he knows how, well and lawful to do his work, so that the said trade shall not be scandalized or the commonalty damaged and deceived by folks who do not know their trade."

THE "SUBURBAN" WINDOW-SCREEN.

In the accompanying illustration we present a window-screen, made by the A. J. Phillips Company, Fenton, Mich., which, while similar to other screens in being readily raised and lowered, and in being removable from

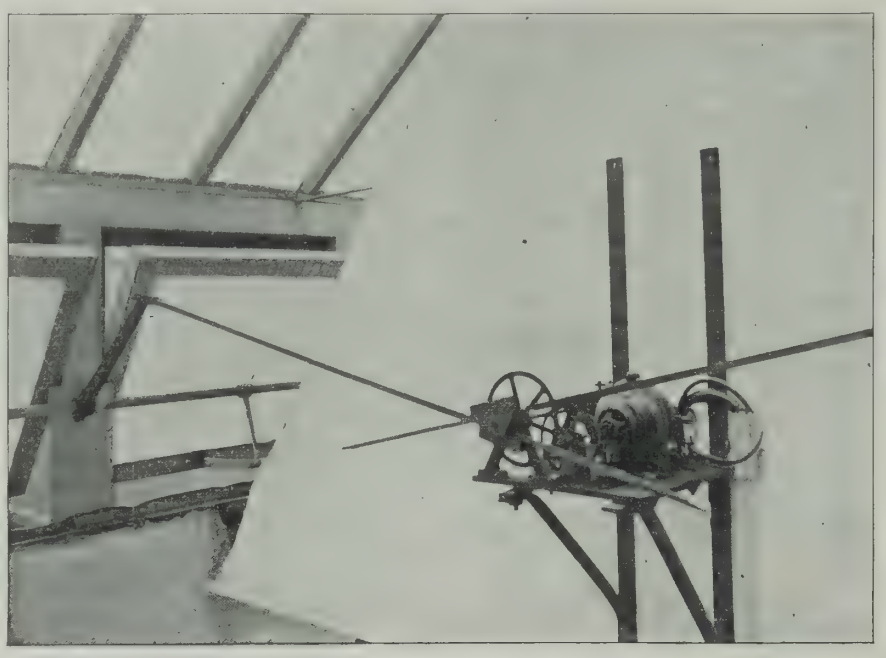
THE "SUBURBAN" WINDOW-SCREEN.

the window, is distinguished from them by being "shaped" on the inner edges, thus giving a neatly rounded appearance to the corners of the screen-frame. The "Suburban" screen, as this particular window-screen is termed, can also be obtained in sizes to fit the full length of the window.

AN INGENIOUS VENTILATOR CONTROLLER.

Many an architect has no doubt often felt that the unsightly rods and cords usually employed to operate the ventilators of rooms detract considerably from the appearance and general effect produced by the interior of a building. It sometimes happens that the architect is hampered in his efforts to provide ventilation; because the artistic effects, which are paramount, will not permit the use of these cumbrous contrivances.

An invention known as the "ventilator motor," manufactured by the New York Electric Motor and Ventilator Company, of 90 Pearl Street, Brooklyn, New York city, removes all these difficulties, by providing a means whereby perfect control of the ventilating mechanism is obtained without marring the artistic appearance of an interior. The engraving which we present herewith shows the apparatus in position for operating a row of windows in a skylight.

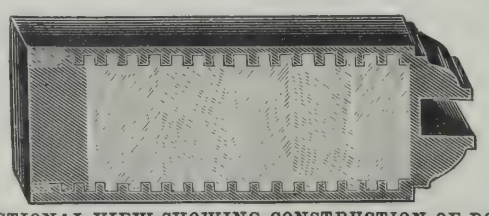


AN ELECTRIC VENTILATOR-CONTROLLER.

The machine consists essentially of a small electric motor, arranged in such a manner that, by means of a simple switch, located in any part of a building, the ventilators can be either partially or entirely opened and closed, whenever it may be so desired. Despite all carelessness in the operation of the switch, no injury can result; for, should the current be turned on through some error, an automatic cut-off stops the motor when the ventilating window is either wide open or tightly closed. When the current is shut off, the window is held securely in whatever position it may happen to be. Apart from its simplicity of construction and efficiency of operation, the device possesses an important advantage in so far as it provides a means for controlling the entire ventilating system of the largest as well as the smallest building from any desired point.

A NOVEL WAY OF CONSTRUCTING DOORS.

The Compound Door Company, whose factory at Hegewisch, Ill., was recently destroyed by fire, have completed their new plant at St. Joseph, Mich. With new



SECTIONAL VIEW SHOWING CONSTRUCTION OF DOOR.

buildings specially designed for the manufacture of doors, and equipped with the best machinery, and manned with their old force of skilled workmen, they are better prepared than ever to execute orders with care and promptness.

In the accompanying engraving we present a sectional view of a door showing the method of construction.

It will be seen from the cut that double the gluing surface is secured, as compared with the flat veneer, together with the additional strength due to the application of the tongue and groove, which overcomes the possibility of the veneers' peeling or blistering.

Not to the method of veneering alone does the company devote its attention, but also to every detail of the work, from the time the lumber enters the yard until it goes out a finished product.

A Course in Architectural Engineering.

The present tendency toward the concentration of business in large cities, and the consequent demand for increased floor area in the business houses, have resulted in the development, during the last ten or fifteen years of a new type of architectural construction.

The introduction of rolled beams of wrought iron and steel, the rapidly decreasing expense of these materials, and their ready adaptation to the needs of the architect have made this new construction possible. The heavy building with solid masonry walls and piers, which was formerly the only prevailing type, reached its practical limit of height before it was a dozen stories from the ground; but with the lighter materials—steel and terra-cotta—the architect is enabled to carry his structure fifteen, twenty, or even thirty stories in the air. With this construction, many new and difficult problems present themselves, which require for their solution both the training of the engineer and the experience of the architect.

To meet these requirements, the Massachusetts Institute of Technology has taken steps that will result next term in a new course in Architectural Engineering, offered as an option in the course in Architecture.

This option begins with the second term of the third year. In place of Academic Design and some of the purely artistic courses, others have been substituted leading to the study of Architectural Engineering. Lectures and problems on the principles of Applied Mechanics, and lectures in the Theory of Structures, including loads and reactions, shears and moments, proportioning of beams, columns and tension pieces, the computation of plate and box girders, wooden and steel roof trusses, steel framing, wind bracing, fireproofing, foundations, arches, etc., give the student the necessary preparation for practical problems in Structural Design, which will form the important feature of the course. In the fourth year some time is given to laboratory tests on the strength of building materials. The course as arranged at present is for undergraduates, but it is hoped that graduate students who have completed the regular course in Architecture will find in the Engineering Option an attractive field for work.

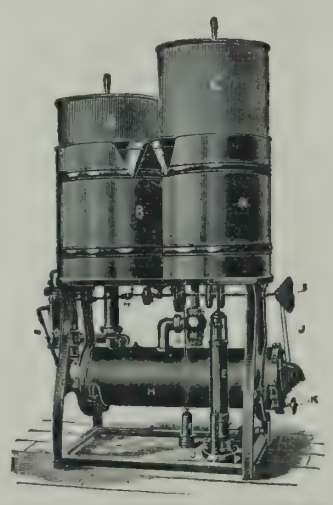
Exhibit of Patents and Inventions.

In connection with the Third Electrical Show to be held in Madison Square Garden, New York city, from May 8th to June 4th, 1899, there will be a Special Exhibition of Patents and Inventions. Inventors can bring their models before a large public and interested parties at small expense.

THE "GASOLEUM" MACHINE.

The "gasoleum" machine, made by the Johnson Temperature Controlling Company, of 411 Dearborn Street, Chicago, Ill., probably constitutes the latest development in gas-machines. In this apparatus the defects of previous machines are overcome by means radically different from any which have as yet been employed. By adapting the Welsbach burner to the "gasoleum" machine, a light is produced which, it is said, exceeds in brilliancy that of the same burner applied to ordinary gas, and has a candle-power four times that of the incandescent electric light. Apart from its value as an illuminating apparatus, the machine possesses the additional merit of being adapted to the requirements of any building, thus enabling the farm house to be lighted with the same brilliancy as the mansion.

The cost of the light produced by the machine depends largely upon the price paid for the gasoline. The makers claim that, however high the price of the gasoline may be, the cost of the "gasoleum" light will not exceed one-fourth that of ordinary city gas. Compared with the electric light, the "gasoleum" light costs only one-fifth as much per hour.



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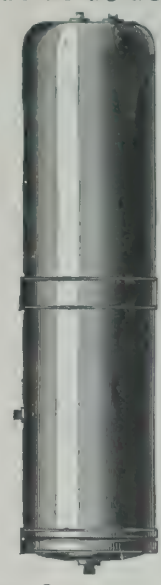

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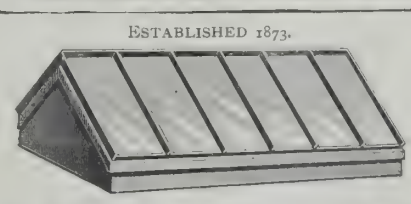

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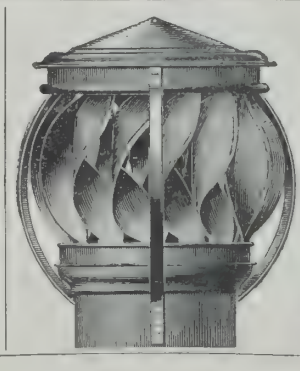

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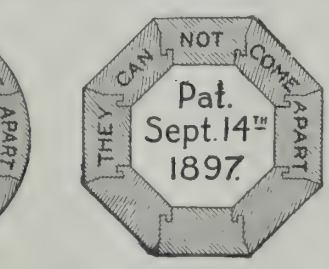

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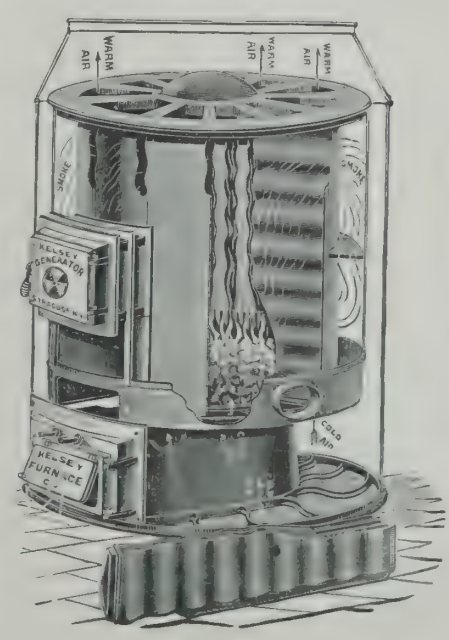

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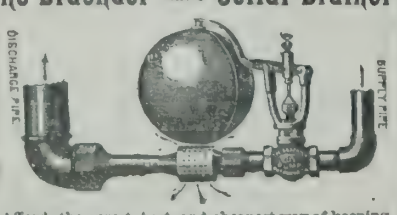

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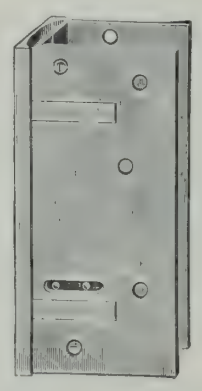

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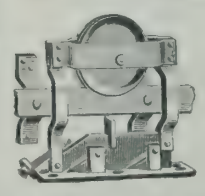

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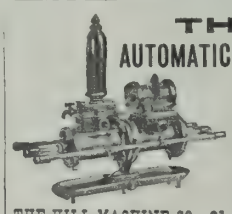

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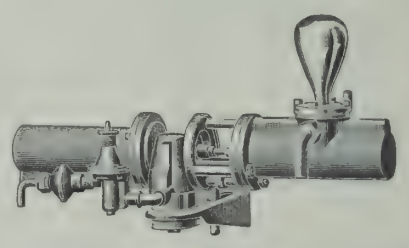

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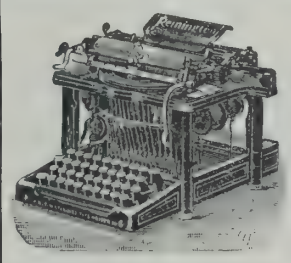

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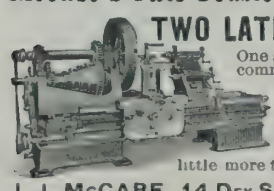

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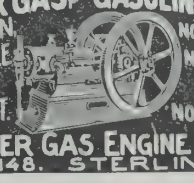

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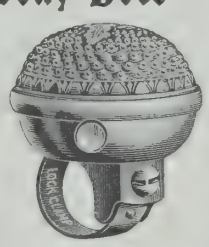

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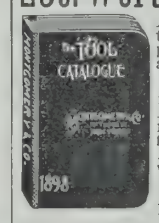

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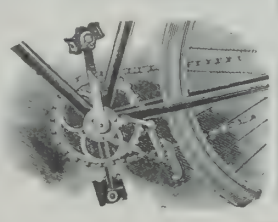

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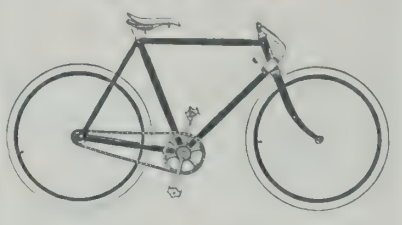

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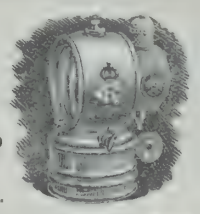

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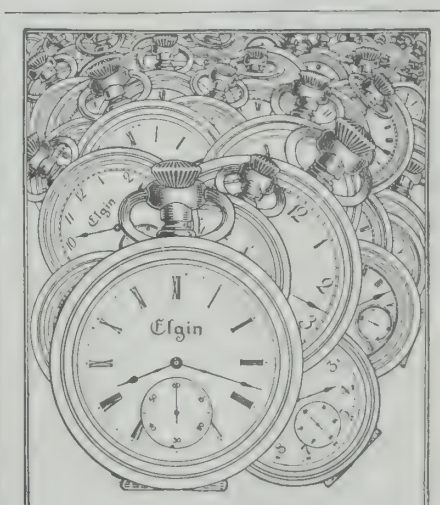

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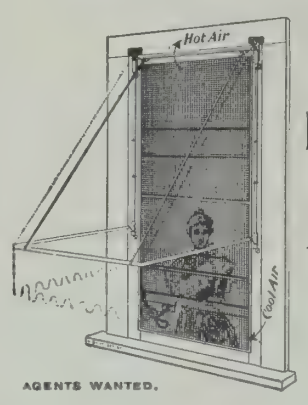

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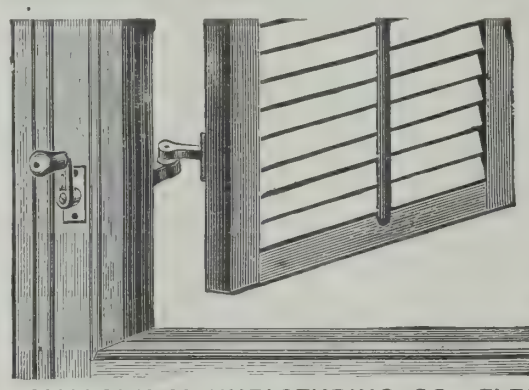

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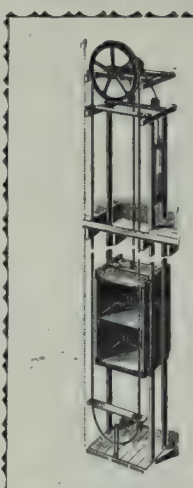

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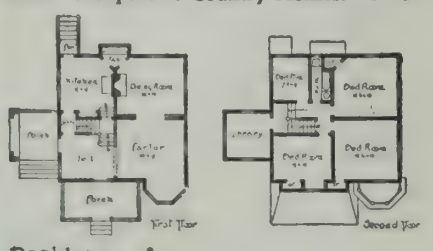

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BAND STAND IN THE NEW HUDSON PARK, NEW YORK CITY.—See page 101.

MESSRS. CARRÈRE & HASTINGS, ARCHITECTS.

THE

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THE NEW YORK CUSTOM HOUSE COMPETITION.

THE Treasury Department, under the Tarnsey Bill, has invited twenty firms of architects to compete in the preparation of designs and plans for the New York Custom House. The following are the names of the competitors: New York: James B. Baker, Francis H. Kimball; Cady, Berg & See; Clinton & Russell; Robert W. Gibson; Israels & Harder; Babb, Cook & Willard; Carrère & Hastings; H. J. Hardenbergh; McKim, Mead & White; George B. Post; Bruce Price; Cass Gilbert; Trowbridge & Livingston; George Martin Huss; Howard, Cauldwell & Morgan. Boston: Peabody & Stearns; Shepley, Rutan & Coolidge. Chicago: D. H. Burnham & Co.; Henry Ives Cobb.

In order to induce the best architects to enter the competition, it is said that Secretary Gage will make important concessions in the matter of compensation. It is believed that the full five per cent. of the entire cost of the building will be allowed. The programme will be simple, and will only indicate the number of stories, how many feet of floor space should be provided, and so on. The character of the building will be left entirely to the individual taste of the architect. A commission composed of the Supervising Architect of the Treasury and two architects or experts in the construction of buildings are to be the judges, a d report to the Secretary as to the relative merits of the designs and plans of the committee. Under the regulations, the selection of one of the designs by the Secretary of the Treasury, and its approval by him and his colleagues, the Postmaster General and the Secretary of the Interior, shall be final and conclusive.

New York has needed a new Custom House for the last quarter century, and it is little wonder that merchants and importers complain that their business is hampered by totally inadequate Custom House facilities. They claim that the methods employed are obsolete, but it is not the function of this paper to question matters of this kind; but we can say that we do not see how modern business methods can be applied in such a thoroughly out-of-date and ramshackle affair as the present Custom House of the second city in the world.

The situation of the Custom House at the very end of Broadway is a most imposing one. It will appear to act as warder to the commerce which fills the street for five miles, and which is without a parallel in the history of the world. In view of the unusual character and honor of the award, the wisdom of inviting a number of well-known architects to enter such a competition cannot be questioned. The selection of any of the architects on the list given above will be a guarantee that we shall not have another horror in the way of a Federal building. It is doubtful if there is in the whole world a collection of buildings so utterly hideous and unmeaning as our Federal buildings, and the working of the new system whereby outside architects are employed, instead of the supervising architect of the Treasury, will be watched with great interest.

ENGINEERING IN ARCHITECTURE.

AT the present time we live the days of steel buildings, electric lighting, elevators, steam-heating, etc., and these subjects all concern the architect to a much larger degree than is generally supposed, and the relations of the engineer to the architect are now much closer than is usually thought to be the case, and the subject is clearly presented in a paper which Mr. H. G. Bradlee recently presented before the American Institute of Architects. After briefly referring to the gradual increase of engineering work in connection with building construction, he finds the function of the architect is that of building beautifully, while that of the engineer is that of securing economy of construction and operation. These two functions are, and must always be, closely related, and it is practically impossible that they should both be mastered by one and the same individual, and, even if they were, each would be a detriment to the other. Consultation and unity of purpose should undoubtedly exist between both branches, for it is now impossible for the architect himself to be the sole designer of all that goes into the modern building. The architect of a modern building, if he is to design it complete in all its details, must therefore be an engineer, and must be familiar with mechanical, electrical, and sanitary engineering in all its branches. Now, each of these departments of engineering has grown to such an extent that a thorough knowledge of its details can only be acquired by years of study and experience, and at the present time they are in such a state of rapid growth that the best work of ten years ago is considered inferior to-day. When engineering work began to creep into architecture, it was first relegated to the contractor, and even to-day many architects expect to receive much aid and advice about matters connected with structural metalwork from the engineers of the manufacturers of the material used. The gradual employment of the consulting engineer has become more common, and the same causes which in the past separated the architect from the builder are now at work separating the engineer from the engineering contractor. There is no definite practice at the present time regarding the employment of engineers, and Mr. Bradlee suggests that the proper relation is to make the engineer the assistant of the architect employed by him, and responsible to him, and not directly to the owner. The engineer is made responsible for the design of the building equipment, and for the results to be obtained from its operation. He should be given every opportunity to design the work in the manner which he considers best. The equipment, however, is subordinate to the building itself, and in most cases it is easier to make changes in the engineering work than in the construction of the building proper. For the reasons given above, the engineer should be under the direct control of the architect, and should be prepared to modify his work to any extent compatible with safety and economy which may be found necessary.

THE APPLICATION OF ART TO NEW INDUSTRIES.

THE subject of the application of art to new industries is a highly important one, and one which is altogether too much neglected in this country. The whole subject was recently admirably presented by the Hon. Charles DeKay at a lecture before the Rembrandt Club of Brooklyn. Mr. DeKay called attention to a heap of monthly magazines which he had before him, which were in English, French, and German. For the most part they have been founded within a few years, and all of them without exception referred to objects of industrial art, and have been founded to further the art industries of their respective countries. While it may be true that many of these magazines have accomplished little, at the same time their appearance is a proof of the deep interest taken by the nations of Europe in the matter of art as applied to their industries. Now, we, for our part, have not been entirely insensible to the pressing needs of making our objects of manufacture what is called "artistic." Efforts have been made to found industrial museums and schools, but it must be confessed that so far very little has been accomplished. There is no country in the world where a determined effort to prove the artistic quality of industrial objects is more needed than ours, or where it would be more profitable when attained, and this for two reasons: first, because of the lack of training in our manufacturers and foremen; second, because the entire tendency in our manufactures is toward cheapness; and with this tendency the artistic cast which an object may be given is liable to be cut off. This, of course, has its good side in rendering the poor man more comfortable, but what we need is a current in another direction which shall set toward the production of beautiful things. These at first would be necessarily costlier than those made by machinery for the people at large. These objects would not sell in as great quantities, but they would pay for themselves, for their beauty and preciousness would command a high price. Moreover, objects made by hand, and designed with the loving care that a painter bestows upon his canvas, or a sculptor upon a statue, will inevitably, in the long run, have their effect upon the machine-made manufactured article. All of its beauty will be retained when it is no longer hand-made, but turned out in hundreds by the machine. In other words, what we need is that a certain number of persons who are by nature set aside as designers of industrial objects shall be encouraged to pursue their career as artist-artisans, just as painters and sculptors pursue their profession. That is to say, what we need is a chance for men and women of talent or genius to do what the great masters of industrial art objects did in Europe during the Middle Ages, and what a few workmen are still doing in Japan.

Mr. DeKay then exhibited some beautiful examples of art work which had been produced in America, and showed how articles of every-day use could be made more beautiful. In New York there is the only society in the world constituted and run for sculptors, a society which has biennial exhibitions of sculpture. There are about sixty working sculptors in this society, and among them are some who have a natural genius for decoration, and with encouragement will produce the most exquisite objects in bronze, iron, or silver, for the drawing-room, the dining-table, vestibule, or office; but, owing to the narrowness of view which still hampers art in the United States, these men seem tied up to lines of sculpture which fail to give their talents the proper scope, and they spend their time on mortuary sculpture, busts of deceased persons made from photographs, monuments for cemeteries, and other things that stimulate very languidly the art that is in them, or when they get a commission for doing the statue of some celebrated person to adorn a park or square. We should give such men a chance to develop their talent and their genius in a line which is a very natural one, because the greatness achieved by them in these lines will do honor to our own country, and will greatly aid in improving the manufactures of America, and thus beat our rivals in the markets of the world.

If the manufacturers of the United States realized what efforts are being made in Europe by the foundation of industrial museums, museums and schools for textiles, wood carving, and cabinetmaking, they would perceive that, so soon as the manufacturers of Europe obtain the machines with which we make our goods, they will produce these articles as cheaply, if not more cheaply, owing to the lower wages that obtain there, and will add to that cheapness the beauty which training in art and natural aptitude combined can give them. Mr. DeKay has had, owing to his official position as Consul-General at Berlin, an excellent opportunity for judging of this matter, and he feels convinced that we cannot be too quick to forestall the loss of such prestige as the American manufacturers already possess, and prepare for a much closer rivalry for such objects in the near future.

THE USE OF COLORED BRICKS.

THE more extensive use of building materials of light-colored bricks was begun about fifteen years ago. Light-colored brick was used before that time, but the use of the buff bricks of Milwaukee was limited, and most of the time prior to the period to which we have referred the bricks used in the East were almost exclusively red brick, and the pressed brick of Philadelphia, Trenton, and Baltimore attained great popularity. The tendency in the past few years has been toward the light-colored bricks, which are made in many colors and shades of colors: thus we have yellow, buff, brown, gray, old gold, light red, salmon red, and cream. Mottling has also been largely introduced. Rough-faced brick, or "rock-faced" brick, as it is called, is also used to a considerable extent. The tendency in the last few years seems to be constantly toward lighter-colored bricks, and now even white bricks are made in large quantities. Bricks may be made to order in almost any color or shade it may be desired. The clays commonly found in most regions burn red, but by mixing together clays from various localities in suitable proportions, and by differences in the firing, various effects can be produced. Hard red bricks cost from $6 to $6.50 a thousand, while the light-colored bricks cost from $25 to $40 a thousand. The latter are not displacing the old red brick, however, as the number of common red bricks used is probably a thousand times greater than the light brick, for fine bricks are used for a veneer only, as it were, for the face of the wall, in the same way brownstone is used, for it would be a waste of money to build walls throughout of expensive brick when the ordinary red brick answers all purposes. Brickmaking is very largely a local industry, and brickyards are found all over the country, so that wherever possible the demand is supplied from the yards near at hand. American bricks are now exported to some extent to Canada, and for many years bricks have been shipped to the West Indies and some South American countries, and to-day American bricks for fireplaces are shipped to Germany and other European countries.

THE Municipal Council of Paris has instituted a competition for façades. In other words, they have decided to give each year certain concessions to houses which have contributed the most to the embellishment of public streets. The proprietors of these houses will be exempt from half of certain taxes, and the architects will receive a gold medal and the builders a bronze medal. The first competition has just been held, and the photographs of the façades before us are very interesting, none of them are particularly astonishing, but they are all in good taste, and give some relief to the monotony of the ordinary Paris street. At the same time, they do not differ sufficiently from the ordinary houses to ruin the monumental effect produced by the long rows of houses with the same general characteristics.

LANDSCAPE ARCHITECTS ORGANIZE.

THE American Society of Landscape Architects was organized in New York city on April 26, 1899 The officers of the association are: President, J. C. Olmstead; Vice-President, Samuel Parsons, Jr.; Secretary, Daniel W. Langton; Treasurer, C. W. Laurie.

The number of landscape architects in the United States is not very large, and, so far as we know, there has heretofore been no organization for mutual help and protection. Great things may be expected of the new society. The officers alone are among the most prominent landscape architects in America to-day.

THE NEW HUDSON PARK.

NEW YORK, perhaps more than any other great city of the United States, or in the world, in fact, is a great waste of brick and mortar, and it is very deficient in well distributed open spaces, although its park area is great, as noted in a recent issue of the BUILDING EDITION. In great capitals of Europe, one is constantly coming upon small squares and parks, even in the poorest quarters; but, until the last few years, New York has been notably lacking in such squares. At last, however, the Park Commissioners have realized their responsibility, and have purchased at enormous cost very expensive pieces of land for the purpose of opening parks, and, with commendable zeal, the Park Commissioners have not built these parks in the well-to-do quarters of the city, but, on the contrary, they have taken the densely populated tenement districts and have built beautiful parks for the people, and along the river fronts have opened recreation piers, where some enjoyment may be obtained by even the poorest inhabitants of the purlieus of the city. The crowded Italian quarters of Mulberry Bend have been swept away to build Mulberry Bend Park, and now a neglected graveyard on the lower West Side has been altered into a charming park.

On our first page we show the new Hudson Park, on Hudson Street, between Leroy and Clarkson Streets. It is not far from the Hudson River, and before it was made into a park it was one of the graveyards belonging to Trinity Church. The grant was given to Trinity Church about a century ago on condition that a church be erected upon the spot, but it was turned into a graveyard instead, and in 1832 the cholera victims were buried there. The city finally entered suit against Trinity Parish for breach of contract, and won the case, taking possession of the land, and at an expense of only $80,000 has turned it into a park, which, for the kind, has few parallels in the world. The gravestones were taken and buried in the part of the park which was to be filled in, and the whole has been very carefully graded. The architects who have brought about this remarkable transformation are Messrs. Carrère & Hastings, who are the architects of the new Public Library and the new Academy of Design. They have made the most of a fairly narrow block, and have tried, as far as possible, to utilize the natural conformation of the ground. Portions of the old St. John's graveyard were below the level of the streets, and this low ground has been used for pools of water. At the end of the depression, which has been carefully graded, is a kiosk, which may be used as a bandstand. Many of the trees in the central part of the park are young, but in a few years it is hoped that they will add greatly to the attractiveness of the park. Wherever possible the older trees were retained, and many of them are of considerable size.

The style which the architects have adopted is a modification of a kiosk in the gardens of some Italian villa owned by a person of great wealth and position. They have taken the idea of the Italian garden, and have modified it to suit the peculiar needs of the park and our climate, and have succeeded most admirably. The balustrade and steps are ornamental, and furnish a fitting background to the kiosk itself. Broad steps on either side give access to the covered building. In front are fountains, and the long strip of water is terminated by a species of balcony. The park is enclosed by iron railings and stone posts, and is illuminated at night by electric lights. Years ago this section of the city between St. John's Church and the old cemetery was the abode of people of wealth, but with the march of time the old families have moved up town, and the result is that the houses have run down, until many of them are tenements of the poorest kind, and it really seems as if the park is built in an ideal spot, as far as reaching the masses is concerned. The park has proved a godsend to many mothers and children who live even quite a distance from the new park. It might, of course, be argued that the architectural adornments of this park would be more suitable for Central Park, the park par excellence of the rich and well-to-do; but there is really no harm in allowing the poor to enjoy good architecture, and such adornments as those of Hudson Park cannot fail to have an elevating influence on visitors.

A DOORWAY AT LUCCA.

WE present herewith an engraving of the doorway of the Archiepiscopal Palace at Lucca, supposed to be designed by Jacopo della Quercia. It is a fine example of early Renaissance work before overloading with ornament became prevalent. The door itself consists of two valves, each composed of four square recesses or coffers; in the center of each coffer is a large rosette, the patterns of each being different. The next to the lower rosettes are provided with rings for opening and closing the doors. The detail of the door proper is remarkably good. The upper corners of the doorway are brackets, which take away from the square appearance. Directly above are two children (putti), modeled in the round, supporting an escutcheon. The doors are in a very good state of preservation, and date from the fourteenth century.

DOOR OF THE ARCHIEPISCOPAL PALACE, LUCCA, BY JACOPO DELLA QUERCIA.

A RESIDENCE AT HOLYOKE, MASS.

WE present as the subject for colors, and also on page 102, a residence which has been erected for F. H. Metcalf, Esq., of Holyoke, Mass. The design presented is attractive and pleasing, and is treated in the gambrel roof style, with Colonial detail and Ionic pilasters. The piazza, part of which is uncovered, is a feature in itself, together with the bay window and porch at side. The underpinning is built of red brick laid up in red mortar. The superstructure, of wood, is covered with sheathing, paper, and clapboards, and is painted a deep red, brilliant in color, while the trimmings are painted a creamish white. The sash are painted cream white, and the blinds bottle green. The roof is covered with shingles and is finished a natural silvery gray color. Dimensions: Front, 46 ft. 1 in.; side, 34 ft. 2 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior arrangement is most excellent, and the whole is finished off in a handsome manner. The hall is treated with white enamel finish, and it contains an ornamental staircase, with newels and balusters treated in a similar manner, while the whole is finished with a mahogany rail. A paneled seat with a paneled back is at side of stairs. The parlor is treated in white enamel finish, and it has a fireplace furnished with a tiled hearth and facings and a mantel of exquisite design. The library and dining-room are trimmed with curly birch and finished natural. The former contains an open fireplace, with a tiled hearth and facings and mantel, and also a bookcase built in at side of fireplace. The dining-room has a buffet built in a handsome manner. The butler's pantry, kitchen, and rear hall are trimmed and wainscoted with North Carolina pine, and each apartment is finished off and provided with all the modern improvements complete. Floors in hall, library, and dining-room are laid with oak. The second floor is trimmed with pine, and is treated in white enamel finish. This floor contains an open hall, sitting-room, three bedrooms, dressing and sewing rooms, and bathroom; the latter is wainscoted and treated with white enamel throughout. It has a floor of oak, and it contains porcelain fixtures and exposed nickelplated plumbing. The third floor contains four bedrooms, 16 x 16 feet in dimensions. A cemented cellar contains furnace and other necessary apartments. Cost, $6,000, including everything complete. Messrs. Clough & Reid, architects, Main Street, Holyoke, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

ST. PAUL'S CHURCH, AT STOCKBRIDGE, MASS.

WE present on page 106 in this issue illustrations of St. Paul's Church, at Stockbridge, Mass. The engravings present an architectural creation of unusual beauty, treated in the modified Norman style of architecture, and a design that is well adapted to its rural surroundings. St. Paul's Church was founded in 1843, and was consecrated in the same year. It was replaced by the present structure, which we illustrate, in 1883, and was consecrated November 12, 1884, as a memorial to Mrs. Charles E. Butler, formerly Miss Sedgewick. The exterior walls of the building are constructed of granite of a light gray color, with rock faces, while the trimmings are of dressed stone. The roof is covered with a brilliant red tile, which gives life to the soft gray tone of the exterior walls. The entrance is through a covered porchway, with arches and columns. The auditorium, 28 x 65 feet, is treated in a very handsome manner with oak finished in dark antique. The walls are lined with light brick. A wainscoting, three feet in height, surrounds the interior walls. The ceiling is open to roof, showing the beams and supports, which are dressed and finished in dark antique oak. The floors are paved with tiles. The chancel and altar is very handsomely decorated with mosaic, carved woodwork, etc. The pews and all furniture is of dark oak. The baptistery is a very handsome design in memoriam by Mr. St. Gaudens. The organ was built by Roosevelt. The seating capacity is two hundred and ten in the pews, with much floor space for the use of chairs in addition. The stained glass windows, very rich in their color scheme and execution, are most excellently designed by the Tiffany Glass Company. The choir and robing-room are conveniently located, and are furnished with all the necessary appointments. A fireplace, with tiled facings and hearth, and mantel, is provided in robing-room. The cellar under the building contains the usual necessary heating apparatus and ample storage room. The Rev. Arthur Lawrence is the present rector. Mr. Charles F. McKim, of the firm of McKim, Mead & White, No. 160 Fifth Avenue, New York, was the architect.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

New York Public Library.

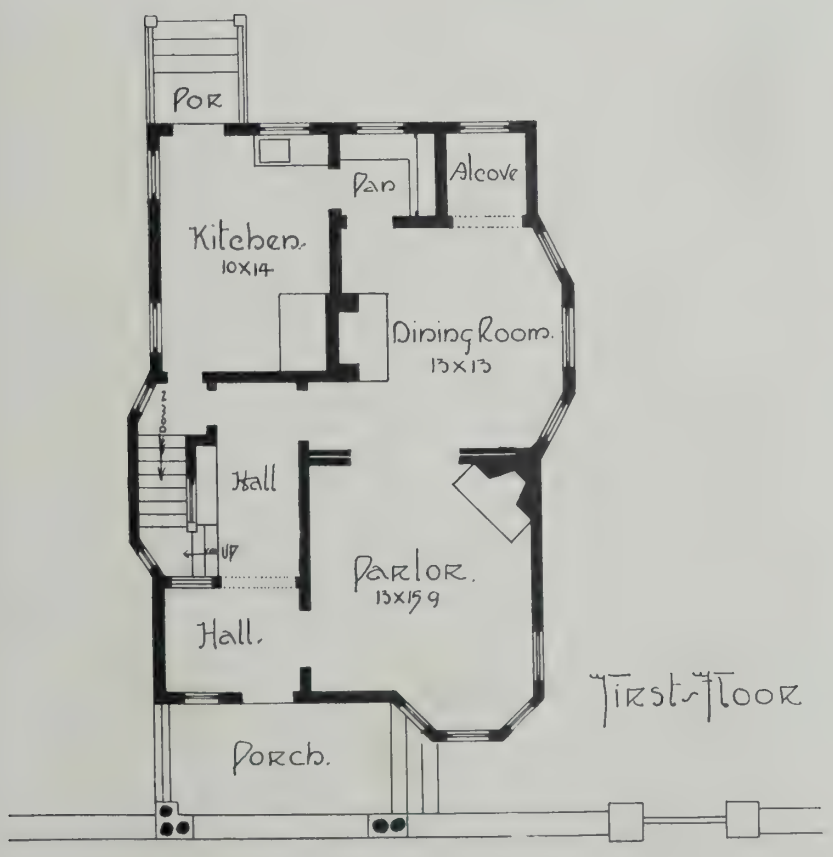
THE Mayor of New York has signed the resolution of the Municipal Assembly providing for the issue of $500,000 in bonds to defray the expenses of removing the old reservoir from Bryant Park and building the foundations for the new Library. The contract for the work of tearing down the reservoir will be let immediately, and the work will begin as soon as possible. Some of the stone used in the construction of the reservoir will be utilized for the foundations, and some will be taken to Riker's Island to be used by the Commissioner of Correction.

Second Floor Plan

BOSTON PUBLIC LIBRARY

A RESIDENCE AT HOLYOKE, MASS.—See page 101.

MESSRS CLOUGH & REID, ARCHITECTS.



A MODERN DWELLING AT LOWERRE, N. Y.—See page 114.

RESIDENCE OF W. R. CONNOR, ESQ.

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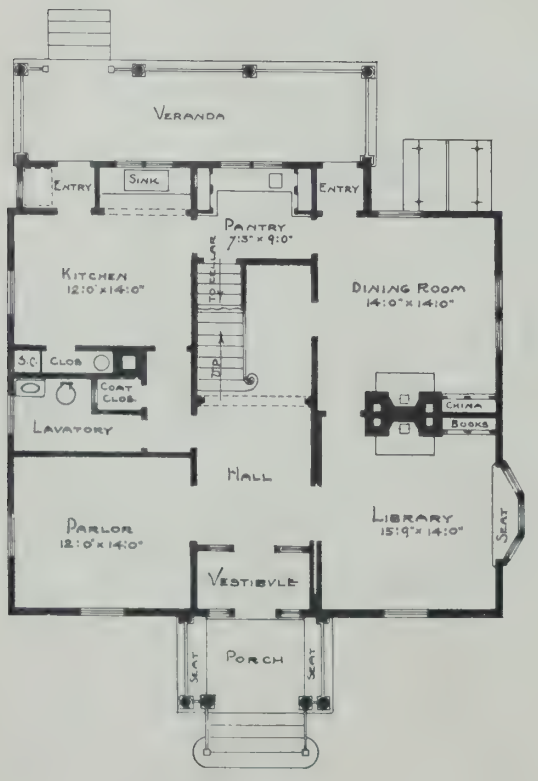
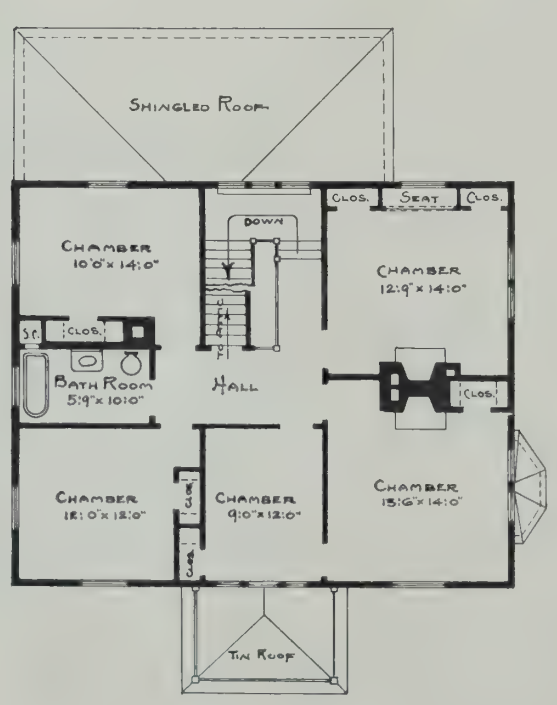
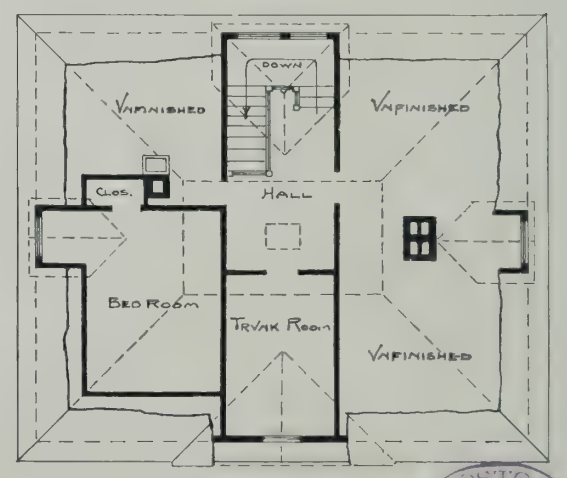


"First Floor Plan"



"Second Floor Plan"



"Attic Floor Plan"

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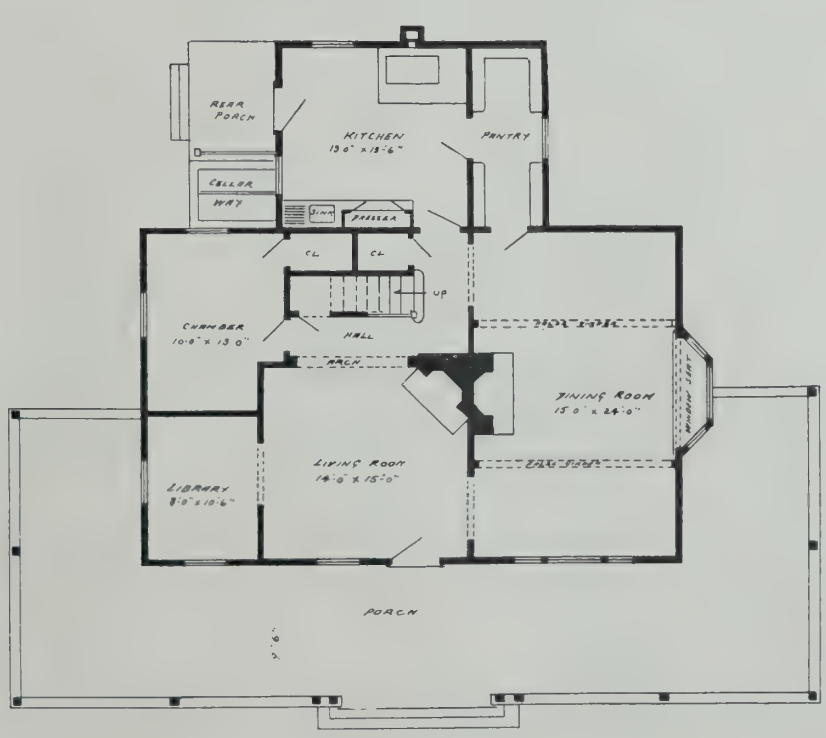
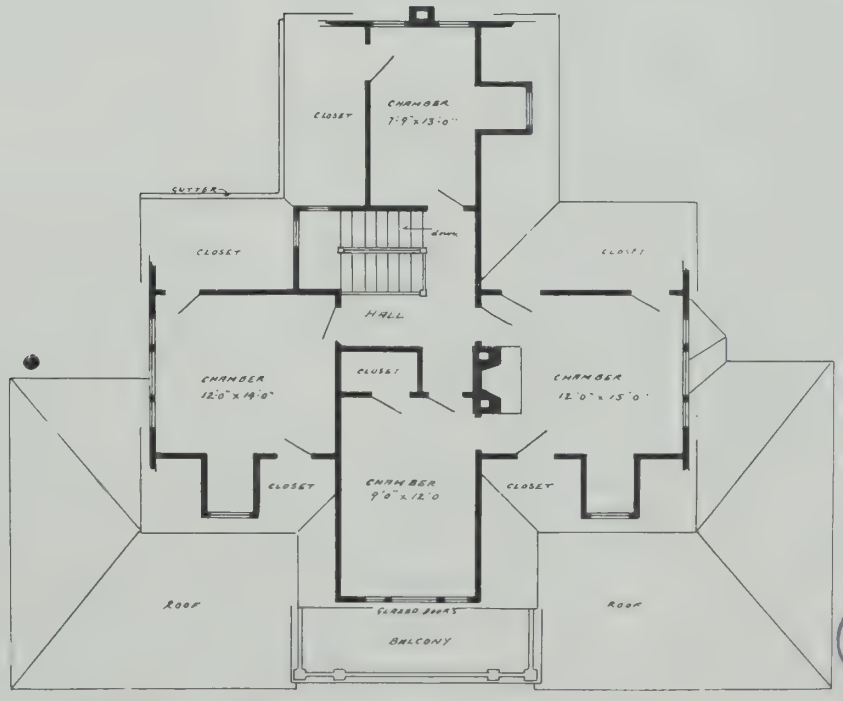
"Lucius W. Briggs Architect"
"Worcester Mass."

A COLONIAL RESIDENCE AT WORCESTER, MASS.—See page 113.

MR. LUCIUS W. BRIGGS, ARCHITECT.



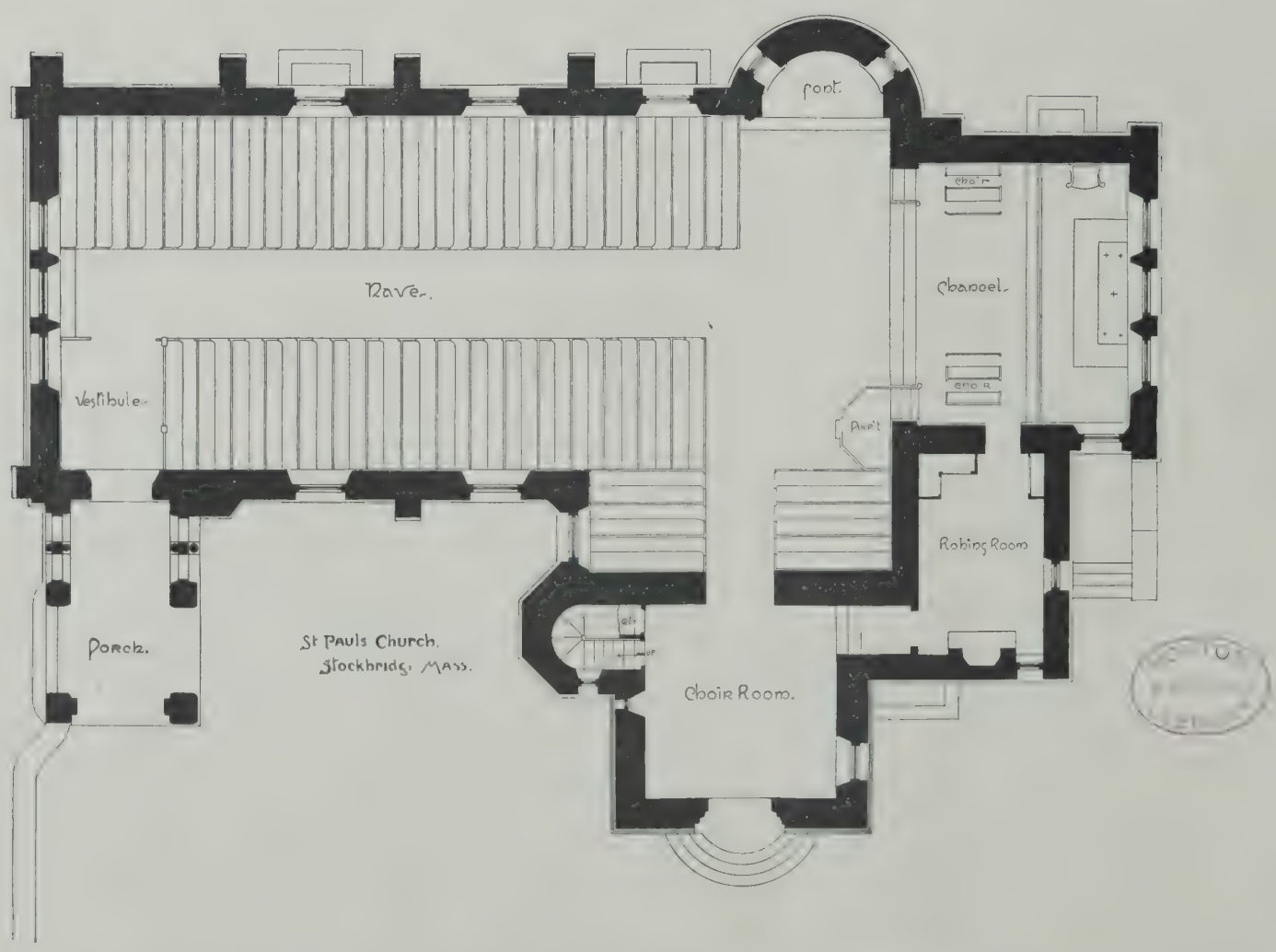
FIRST STORY PLAN
1/8" SCALE



ATTIC PLAN
1/8" SCALE

A SUMMER HOME AT MARTHA'S VINEYARD, MASS.—See page 113.

MR. HENRY C. PELTON, ARCHITECT.



ST. PAUL'S CHURCH, AT STOCKBRIDGE, MASS.—See page 101.

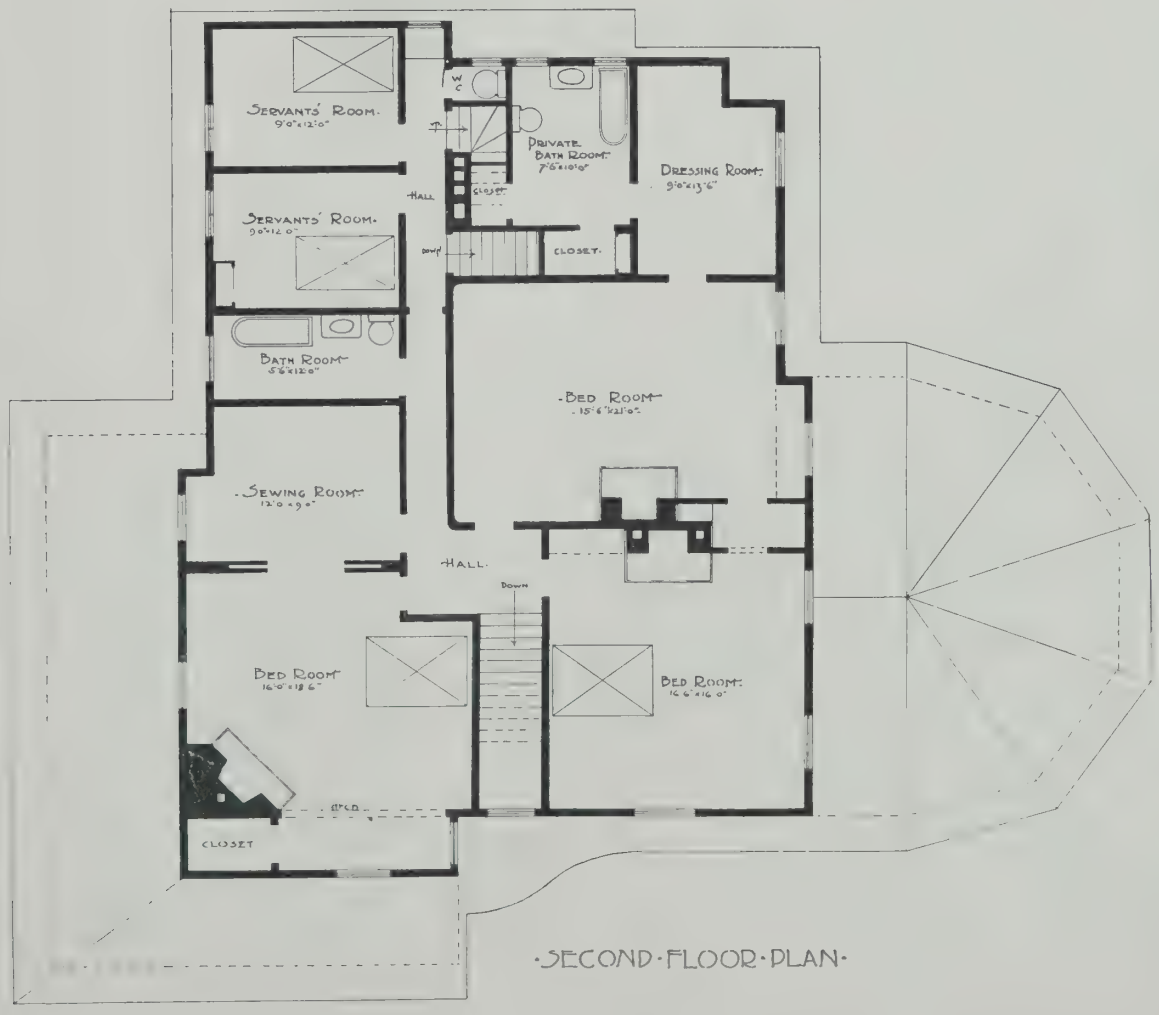
MESSRS. McKIM, MEAD & WHITE, ARCHITECTS.

1. Long Room, or Banqueting Hall.
2. Chair of John Hancock, and Table on which the Declaration was signed.
3. Independence Hall as it appeared in 1778.
4. Independence Hall, showing the Restoration.
5. Interior View of Main Entrance.
6. South Window of Tower Staircase.
7. The Liberty Bell, in Hallway.
8. Revolutionary Relics discovered in East Wall.

THE RESTORED INDEPENDENCE HALL, PHILADELPHIA—See page 114.

A MODERN RESIDENCE AT PROSPECT AVENUE, HACKENSACK, N. J.—See page 114.

MR. HUGH ROBERTS, ARCHITECT.



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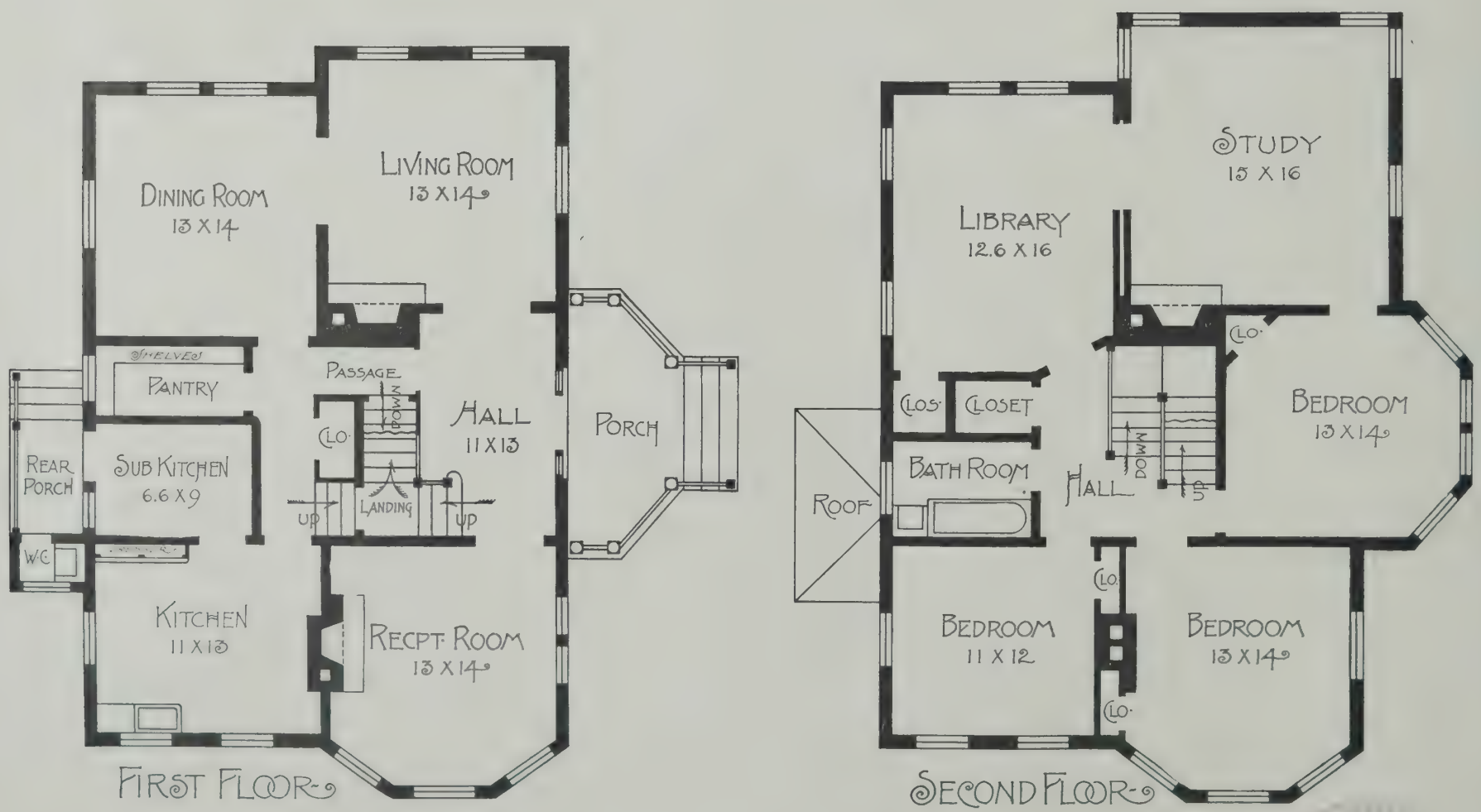
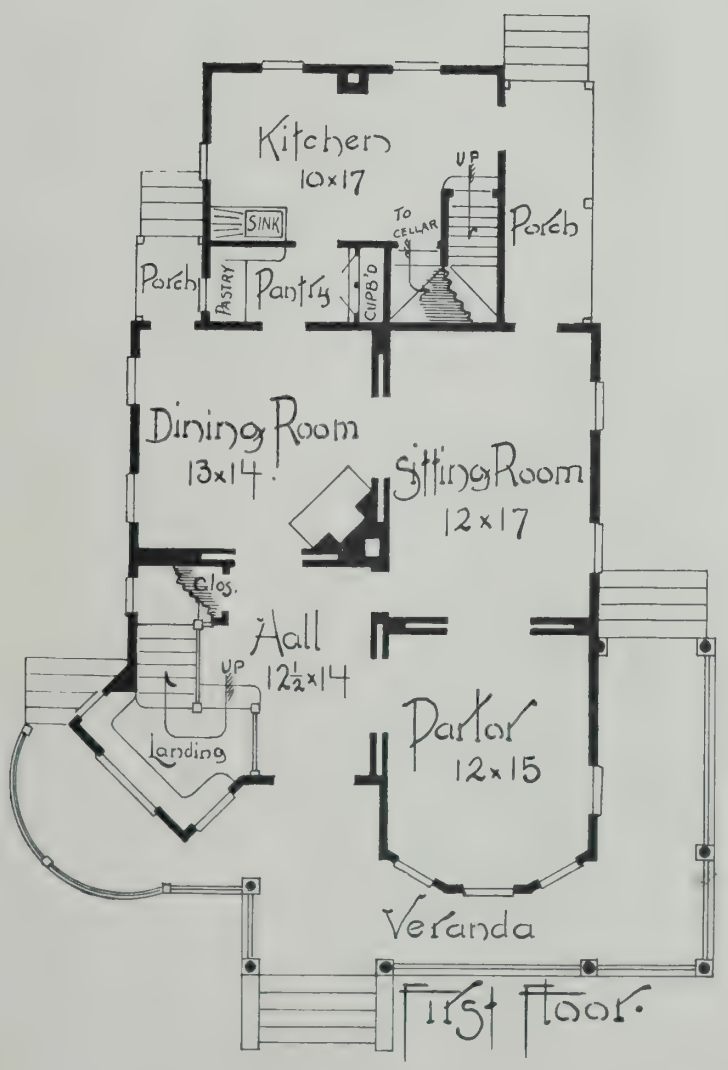
A MODERN RESIDENCE AT PROSPECT AVENUE, HACKENSACK, N. J.—See page 114.

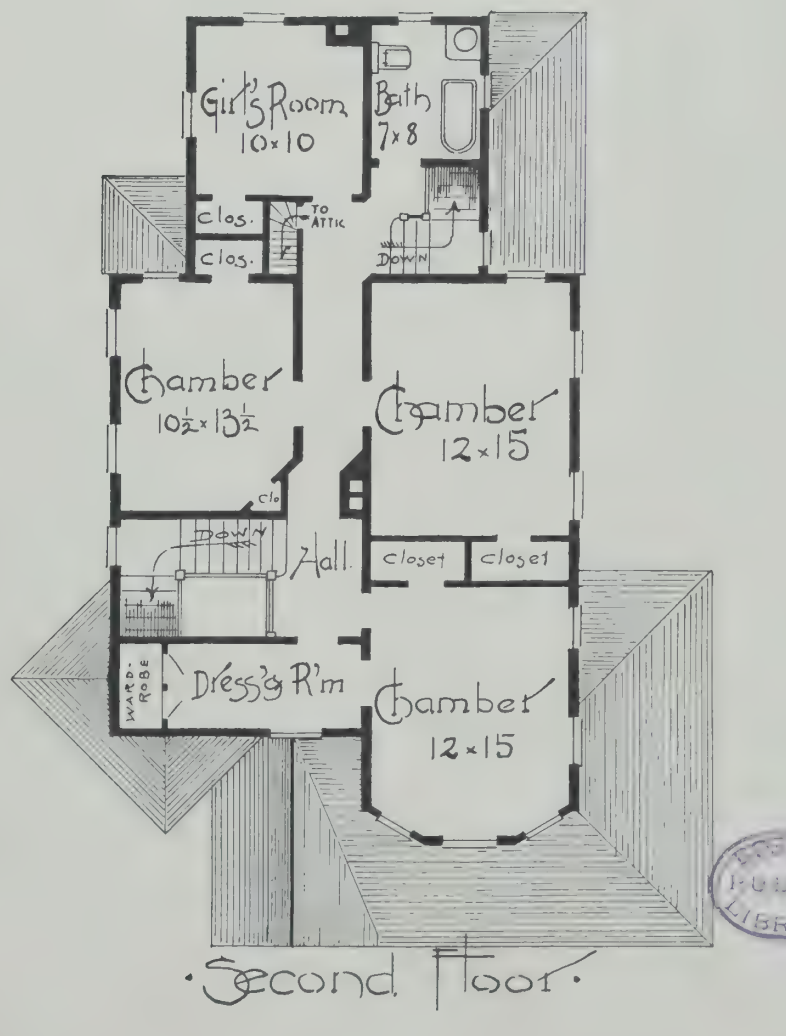
MR. HUGH ROBERTS, ARCHITECT.



PROF. W. C. LAWTON'S COTTAGE, BRYN MAWR COLLEGE, PA.—See page 114.

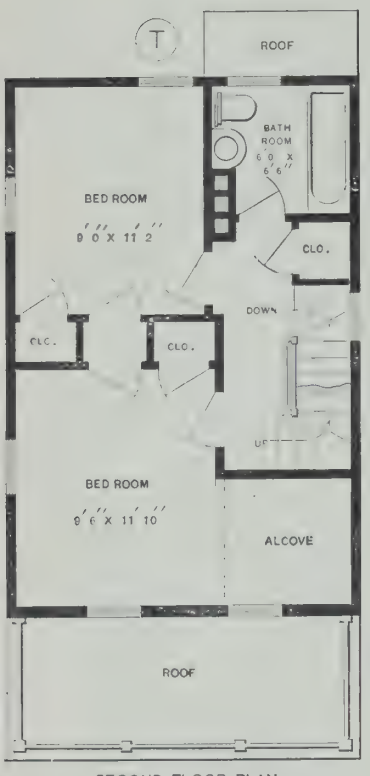
MR. J. C. WORTHINGTON, ARCHITECT.



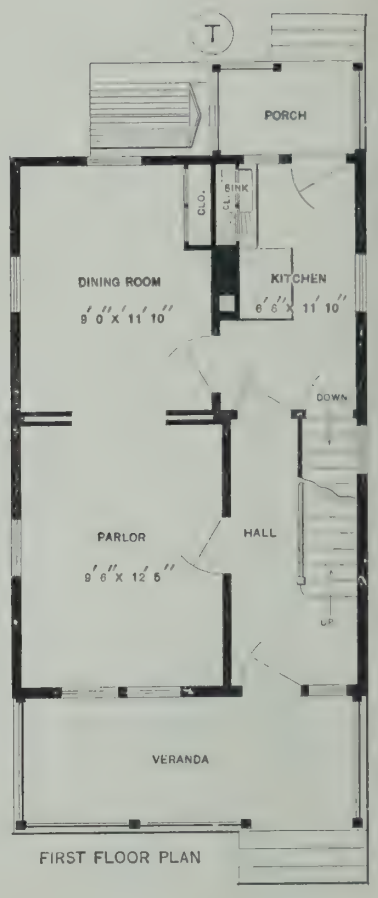


A RESIDENCE AT QUINCY, MASS.—See page 114.

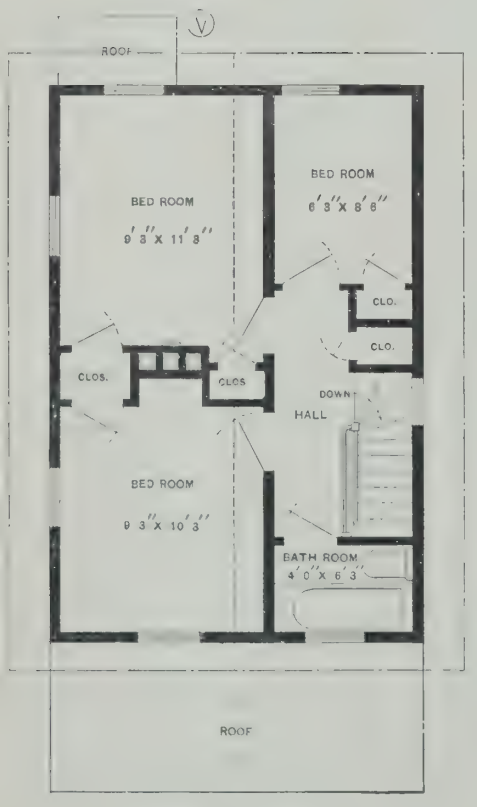
MESSRS. GEORGE W. PAYNE & SON, ARCHITECTS.



SECOND FLOOR PLAN



FIRST FLOOR PLAN



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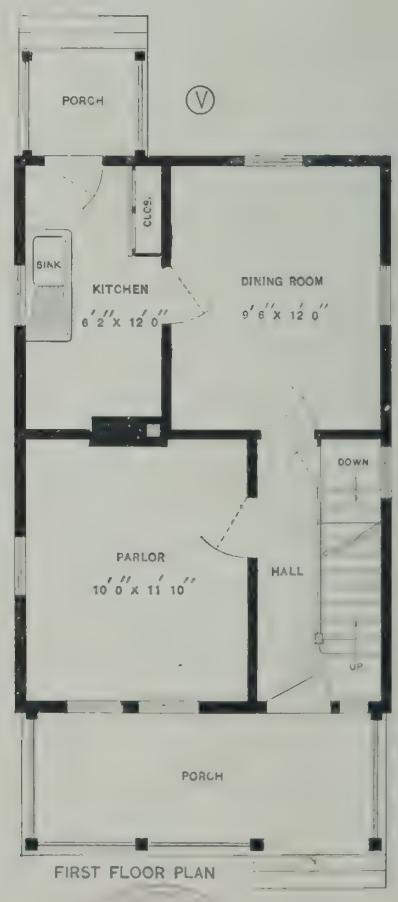


FIRST FLOOR PLAN

SOME MODERN LOW COST HOUSES AT HOMEWOOD, L. I.—See page 113.

MR. PERCY GRIFFIN, ARCHITECT.

A COLONIAL RESIDENCE AT WORCESTER, MASS.

WE present, on page 104, in this issue, a Colonial residence which has been erected for Messrs. E. L. & S. D. Spurr, at Worcester, Mass. It is treated in a simple and inexpensive manner, and is thoroughly artistic. The entrance porch and doorway, and front gable, with its lunette window, form effective features on the front, while the spacious veranda on the rear, overlooking the flower gardens, is a delightful retreat during the heat of a summer day. The underpinning is built of New Hampshire granite ashlar, with beaded joints in Portland cement. The walls are clapboarded, and painted light buff, with ivory white trimmings. The roof is left to weather stain. The dimensions are: Front, 39 ft.; side, 32 ft., not including the rear projection and veranda. The heights of ceilings are: Cellar, 8 ft.; first story, 8 ft. 9 in; second story and attic, 8 ft. 3 in. The parlor, hall, and library are finished in white enamel, with oak floors. The dining-room is in Flemish oak, and the kitchen, pantry, etc., are in North Carolina pine. The hall is divided in its length by a wood arch, supported on fluted pilasters; the rear part contains the stairs, effectively treated with white balusters and mahogany rail, the balustrade terminating in a spiral at the bottom. The walls are hung with a chrome yellow figured paper. The color scheme in the parlor or reception room is a delicate sage green, with white raised figures. The library has an oriole bay with a window seat, and a fireplace, laid up in red pressed Roman-shape brick. The mantel and built-in bookcase form a continuous feature. The walls are wainscoted three feet high, with base and cap, and finished in white. Above the wainscoting the walls are covered with a dark red satin striped paper. The dining-room contains a fireplace, laid up in mottled brick, with a high Doric mantel, and a built-in china case, inclosed by fancy glazed doors, and forming a continuous design with the mantel. The walls are hung with a dark rich tapestry paper. The chambers on the second floor are painted in light tints to harmonize with the wall hangings. The bathroom is finished in oak, with trimmings and wainscoting, and it contains porcelain fixtures and exposed plumbing. The chamber fireplaces are laid up in delicate colored glazed tile, with simple Colonial mantel. The third floor contains a servant's chamber, trunk-room, and a large unfinished storage room. The cellar contains a laundry, connected with the bathroom and kitchen by a soiled clothes chute, and a vegetable cellar, separated from the heater cellar by brick walls. The cellar bottom is cemented and the ceilings are plastered. Cost, $4,800 complete. Mr. Lucius W. Briggs, architect, 452 Main Street, Worcester, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

SOME MODERN LOW COST HOUSES AT HOMEWOOD, LONG ISLAND.

WE present on pages 112 and 113 in this issue some low cost modern houses which have been erected for the City and Suburban Homes Company at Homewood, Long Island. In the April issue we illustrated one of the more expensive houses built by the same company at Homewood, while we publish in this issue two of the least expensive ones, together with a view showing one of the principal streets of Homewood. The smaller house of the two, which we illustrate herewith is an ideal model for a workingman's house. It is good architecturally, and a most effective use is made of stucco. The lines are square, and the piazza and latticed windows are the features of the design. The only beamed work is the spandrel at piazza. The roof is covered with slate. The woodwork is painted a dark umber. Dimensions: Front, 18 ft.; side, 26 ft., not including porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. The interior of this house has been designed with the strictest economy of space, and the greatest care has been given to its planning. The arrangement of kitchen and closets is most convenient. The interior trim throughout is of cypress, and the floors are of matched Georgia pine. The hall contains an ornamental staircase, with turned newel, posts, balusters, and rail. The parlor is furnished with a neat wood mantel at chimney breast. The second floor contains three bedrooms, four closets, and bathroom; the latter is wainscoted and furnished with porcelain-lined bathtub, closet, and exposed nickel-plated plumbing. The attic is reached from a scuttle, and provides ample storage. A cemented cellar contains laundry and the usual necessary rooms. The second illustration on the same page shows two houses which are alike in design, but more expensive than the one already described. They are treated in a brick and stucco combination, with half-timber work in gables. The first story and underpinning are built of brick, while the second story is covered with plaster left in its natural gray color. The woodwork is treated in a dark umber color. Dimensions; Front, 18 ft.; side, 27 ft., not including porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft.; third, 7 ft. 6 in. The interior is trimmed with white pine, finished natural. The hall contains an ornamental staircase turned out of pine. The parlor and dining-room are separated by sliding doors, the latter is provided with a china closet. The kitchen is well fitted up with sink, closet, dresser, and hearth for

VIEW OF ONE OF THE STREETS AT HOMEWOOD, L. I.

range. The second floor contains two bedrooms and alcove, and also bathroom. The bathroom is wainscoted, and it contains a porcelain-lined tub, closet, and lavatory, with exposed nickelplated plumbing. Stairs lead to third floor, which contains two bedrooms. The floors are laid with matched Georgia pine. A cemented cellar contains furnace and other necessary apartments. The cost of the smaller house is $2,800, including a plot of ground 30 x 100 feet. The cost of the two larger houses is $3,150 each, including a lot 30 x 100 feet. Mr. Percy Griffin, of No. 48 Exchange Place, New York city, N. Y., was the architect of both houses.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A SUMMER HOME AT MARTHA'S VINEYARD, MASS.

WE present on page 105 a summer home which has been erected for John A. Jeremiah, Esq., at Martha's Vineyard. The building is designed for summer use, and is treated in a simple, but artistic manner. Its elevations are attractive and pleasing, and the plans are most excellent. The building rests upon brick piers.

There is no cellar, except a small circular one built like a cistern, and placed at the rear of the house, with outside entrance thereto. The building above is covered with white cedar shingles, left to finish natural. The trimmings are painted white. The roof is also shingled and treated similar. Dimensions: Front, 40 ft.; side, 38 ft., not including piazza. Height of ceilings: First story, 9 ft.; second, 8 ft. The interior throughout is trimmed with whitewood, some of which is stained in imitation of old oak, while the remainder is finished natural. The living and dining rooms are attractive apartments. Both have open fireplaces, built of pressed brick, with hearth and facings of same, and oak mantelshelves. The dining-room has false beams carried across the ceiling, and also a bay window thrown with seat. The staircase hall, separated from living-room by an archway, contains an ornamental staircase turned out in a neat manner. The library is a quiet nook separated from hall by an archway. The kitchen and pantry are fitted up in a complete manner. There is one bedroom on first floor, and three bedrooms and servant's room on second floor. Mr. Henry C. Pelton, architect, St. James Building, No. 1133 Broadway, New York City, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN RESIDENCE AT PROSPECT AVENUE, HACKENSACK, N. J.

We present as a subject for illustration, on pages 108 and 109, in this issue, a modern residence which has been erected for Asa W. Dickinson, Esq., at Prospect Avenue, Hackensack, N. J. The engravings show a design of modern treatment, of the gambrel roof order, with many excellent features, including a spacious piazza, porches, bay windows, etc. The underpinning is built of brick laid up in red mortar. The superstructure above is of wood, with the exterior framework sheathed, papered, and covered with shingles, and stained a reddish brown color. The trimmings are painted bottle green. The roof is shingled and stained a moss green effect. Dimensions: Front, 55 ft.; side, 40 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior throughout is trimmed with whitewood. The entrance hall is separated from the reception hall by a screen formed of base, from which rise twisted balusters to ceiling of ornamental design. The reception hall contains an open fireplace, built of red brick with hearth, and facings of same, rising to ceiling, with mantelshelf. The staircase, of oak, with its broad landing thrown out in an octagonal projection, is furnished with a newel post rising to ceiling, while the balusters are treated in a similar manner. The sitting and dining rooms, of large dimensions, are fitted up in a handsome manner, and they have open fireplaces, trimmed with tiled hearth and facings, and mantels of excellent design. The floors are laid with hardwood. The kitchen, pantries, and laundry are finished natural, and each room is furnished with the best modern fixtures complete. The second floor contains three large bedrooms, dressing-room, sewing-room, two bathrooms, and two servants' bedrooms, all fitted up complete in their respective manner. The fireplaces where shown have tiled trimmings and mantels. The bathrooms are wainscoted, and are furnished with porcelain fixtures and exposed plumbing. The third floor contains an open attic for storage; rooms could be finished off if desired. Cemented cellar contains furnace and other necessary apartments. Mr. Hugh Roberts, architect, No. 76 Montgomery Street, Jersey City, N. J.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A RESIDENCE AT QUINCY, ILL.

The attractive residence, which we illustrate on page 111, in this issue, has been recently erected for Mr. H. B. Wheeler, at Quincy, Ill. The foundation is built of stone, and is eighteen inches thick. The superstructure is of wood, the outside walls sheathed diagonally, then covered with paper, and weather-boarded with half-inch pine siding. The gables and roof are covered with shingles. Dimensions: Front, 31 ft. 6 in., including all except projection of front porch; side, 47 ft. 6 in., including all but projection of front porch and steps. Height of ceilings: Cellar, 7 ft.; first story, 10 feet; second, 8 ft. 4 in., all in the clear. Cellar under the entire building contains furnace room and other necessary apartments. The front hall in first story contains a staircase of excellent design, with nook and seat on lower landing. The woodwork in first story is of Wisconsin red oak, and for second story of cypress wood, all finished natural color in hard oil. Back of the dining-room, and accessible through the pantry, is the kitchen. The pantry is fitted with all modern improvements. From the kitchen is the back stairs to second story. On the second floor are four good bedchambers and bathroom, each room being provided with ample closets. The plumbing is quite complete for a house of this class, with handsome fixtures, and hot and cold water throughout. The heater is placed in basement under the front part of the house. Cost complete, $2,800, and could be duplicated in most places for that amount. Messrs. George W. Payne & Son, architects, Carthage, Ill.

Our engravings were made direct from photographs of the building, taking specially for the Scientific American.

A MODERN DWELLING AT LOWERRE, N. Y.

We present on page 103, in this issue, a modern dwelling which has been erected for W. R. Connor, Esq., at Lowerre, N. Y. The building combines good elevations and well arranged plans. The underpinning and fence at front are built of rock-faced stone, laid up in a rough manner. The building above is of wood, and the exterior framework is sheathed, papered, and then covered with clapboards and shingles. The first story is painted a light olive green, with bottle green trimmings. The shinglework is finished in its natural state. The roof is shingled and finished similar. Dimensions: Front, 26 ft.; side, 36 ft., not including porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The interior throughout is trimmed with whitewood and finished natural. The hall contains an ornamental staircase, separated from entrance hall by an archway, with columns rising to ceilings. This staircase has a paneled seat at side, and is lighted effectively by stained glass windows. The parlor is treated with ivory white, and it contains a bay window at corner, and an open fireplace, with tiled facings and hearth, and mantel with columns and mirror of Colonial style. The dining-room has a bay window at one side of room, a pleasant nook, and an open fireplace, with tiled trimmings and mantel. The kitchen and pantry are wainscoted and fitted up with all the best modern fixtures complete. The second floor contains four bedrooms and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and ample storage. A cemented cellar contains laundry, furnace, and other necessary apartments.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

PROF. W. C. LAWTON'S COTTAGE, BRYN MAWR COLLEGE, PA.

We show on page 110, of this number, the residence of Prof. W. C. Lawton, on the grounds of the Bryn Mawr College, Bryn Mawr, Pa. The design is that of a modern cottage of good form, convenient plan, and best construction. The underpinning is of local stone, above that sheathed on studding with hemlock boards, and then covered with paper and clapboards. Roof is of white cedar, shingles left to weather. Dimensions: Front, 40 ft.; side, 28 ft., not including front or rear porch. Height of ceilings: Cellar, 8 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. There is an entrance porch, with columns supporting bay above. Hall has broad openings to reception and living rooms, both of which have open fireplaces, with red brick facings and small corbeled shelves of wood. Kitchen, provided with the usual fixtures, connects by a passage with the dining-room. There is a good sized pantry and subkitchen, or laundry. A servant's closet opens on rear porch. Second floor contains three bedrooms, bath, library, and study; the two last named rooms, which could, of course, be used as bedrooms, are connected with sliding doors. Study has an open fireplace. Third floor contains one bedroom and tank. House is heated by one large forty-eight-inch furnace, located in cellar (cemented), every care being taken to secure the best results in flow of hot air. The interior finish is white pine, stairs being chestnut. Clapboards are painted a deep yellow-pink tone, while the blinds are dark brown, and trimmings white. Cost of house complete, $5,000. J. C. Worthington, architect, Philadelphia, Pa.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

THE RESTORED INDEPENDENCE HALL, PHILADELPHIA.

BY F. W. PARSONS.

Students and lovers of the Colonial style of architecture, seeking its highest and most perfect type, will find in the restored Independence Hall, at Philadelphia, the finest existing specimen of Colonial architecture of the close of the Queen Anne period.

The simple dignity of the exterior of the Old State House, known as Independence Hall, and striking but chaste beauty of its whole interior, are alike wonderful, when it is borne in mind that this restoration, recently completed with such infinite care and historic accuracy, reveals a structure erected at a time when all Philadelphia contained but 2,076 private houses, a few other public buildings, stores, churches, etc.

The title, Independence Hall, attaches properly to that group of restored buildings on Chestnut Street, Philadelphia, between Fifth and Sixth Streets, comprising the old State House of the "Province of Pennsylvania," with its two wing buildings, on the east and west, connected by intervening arcades.

The city and county buildings, located at the corners of Fifth and of Sixth Streets, are of historic interest and architectural importance, but of a later construction, not having been erected until after the Revolutionary War.

Independence Hall, or the State House proper, is 107 feet wide, 45 feet deep, and 50 feet high. The distance from the ground to the top of the steeple, in the rear, is 160 feet. As restored, the first floor is divided into two rooms, each forty feet square, with ceilings twenty feet high. These rooms are separated by a hallway, twenty feet wide, running through the building, from north to south, to the tower staircase in the rear, which leads to the second floor.

The modern arch and Corinthian columns that for many years had framed the main entrance to the State House have been removed, and plain, heavy oaken doors, with square panels, flat arch, and fanlight above, have been substituted. Hinges, locks, antique key, and door knob (some originals) have been fitted to this door. The main entrance is now an exact reproduction of that through which the patriots and statesmen of 1776 passed, in attending sessions of the Continental Congress. Even the original stone steps upon which they trod in entering has been located, but not itself restored, as it is now the property of a family in Chickies, Pa., who use it as a parlor hearthstone. When the old entrance to the State House was first altered, this step was sold at auction, with the result stated. Another of the same form and material takes its place.

The east room on the first floor of the State House, on the left of the main hall, is the chamber of the Declaration, wherein that memorable document was first presented and signed. The ceiling is ornamented with a centrepiece of wreath and laurel leaf decoration. The centrepiece of the east wall of this chamber is the identical one that surmounted President Hancock's dais and chair at the session of July 4th, 1776. It is the choicest bit of carving in the room, and formerly bore in its centre the Royal Arms. Much of the original construction remained in this room, making perfect restoration of woodwork and carving comparatively easy. In restoring this old Assembly chamber, two old fireplaces, which had been walled over early in this century, were uncovered and found to be substantially intact. Even the soot upon them when last used was still in evidence, and remains there to-day. Surmounted by Colonial mantels, the blackened backs and side jambs of these old fireplaces appear now as they originally were.

In the northeast and southeast corners of the east wall of Independence chamber, blank doors have been introduced. A doorway on the southeast undoubtedly led out to the temporary library of the old Provincial library. These two doors balance each other, and bring the room into general harmony with the Judicial chamber opposite. The style and treatment of this room are Doric.

All of furniture in this chamber of the Declaration had a place there at the time the Declaration was signed. Many portraits of the signers adorn the walls.

When Independence Hall was first erected, the west chamber, or Supreme Court of the Province, across the hallway from the Assembly chamber, was separated from the hall by an open arcade composed of three arches, supported by beautifully molded imposts. The arches sprang from Doric pilasters, graceful columns between these pilasters supporting the frieze above, making a charming effect of the Doric treatment.

When the State House was altered in 1813, this arcade was closed up by wooden partitions, but not destroyed, the central arch being left open and fitted with a door of entrance to the Court room.

The recent restoration has demonstrated that none of this original structural work has been destroyed, but it was merely covered up in the manner described, and the removal of this partition or wall has brought to light this noble feature of the interior.

A Doric frieze skirts this beautiful Court room, supported by Doric pilasters, beautifully fluted, and carried on pedestals about three feet in height.

The ceiling centrepiece is composed of two wreaths, ornamented by laurel-leaf decoration. A space between the wreaths is decorated with rosettes.

A removal of the west wing of modern construction revealed the presence of two old original windows in the west wall of this Supreme Court room. These windows lighted the chamber, and were immediately back of the judges' dais. In the former alteration of the building these windows had been preserved intact, though walled over, even the original window frames being retained in position. These windows, now uncovered, form leading features of the west wall, fronted by a dais, in facsimile of that which was graced by eminent lights of the Supreme Court of the Province.

A door formerly led from the southwest corner of this room into the State House yard, with a quaint old stairway leading to it from the floor of the Court room. This has been restored, and, for architectural harmony, a blank door has been placed in the northwest end, corresponding

in style to the one described. The prevailing color of the walls and ceilings of the whole first floor is Colonial buff, china gloss finish.

The restored second floor is divided into three rooms, one a long room or hall, extending 100 feet on Chestnut Street, by twenty in width, with a passage leading southward from it to the staircase. On either side of this passage, or vestibule, and opening into it, are two smaller rooms, each twenty feet wide. Ceilings of all three of these rooms are sixteen feet in height.

The graceful arch spanning the passage leading from the long room, or banqueting hall, into the vestibule connecting all three rooms, is Grecian in character and exquisite in execution. Cornices of the rooms of the second floor of the State House are also Grecian, with egg and dart molding and dentil blocks. Walls of the second floor are tinted a soft Colonial buff, copied by Architect T. Mellon Rogers from facings of Washington's military coat.

In restoring the second floor, old fireplaces in all three rooms were found to have been walled over, but preserved intact, with smoked backs and hearths, as when last used. Original tiles were found preserved in the loft of the State House, and a clue to the character of the mantels was found in bits of white carved wood embedded in the masonry.

Architects, archaeologists, and patriots owe a debt of gratitude to Architect T. Mellon Rogers, of Devon, Chester County, Pa., to whom the work of restoration has been a labor of love. Thanks are also due the whole committee on restoration, but more particularly to Charles S. Keyser, Esq., of Philadelphia, principal historian of the restoration. Their vast research through original documents, old prints, forgotten records, and inquiries among the oldest living men were equaled only by their care and accuracy (particularly that of Messrs. Rogers and Keyser) in examining the building itself, thus making invaluable discoveries. It was found that, to a wonderful extent, "while adapting the State House to the alterations required by later uses, sedulous care had been exercised to preserve intact the original work of the building." As Mr. Keyser truly remarked, in a report to Mayor Warwick: "Underlying all modern work, there remained the old State House of Colonial times and the Revolution."

The restoration of the second floor of the State House was mainly paid for by Philadelphia Chapter of the Daughters of the American Revolution, though partly by the city of Philadelphia. All other work was paid for by councilmanic appropriation, and was under the personal supervision of Director Riter, of the Municipal Department of Public Safety, acting with the aid of an advisory committee, and greatly aided, in its early stages, by the advice and researches of Mr. Charles S. Keyser, the late Dr. Stone, and others. T. Mellon Rogers was throughout the supervising architect of the restoration.

The restored wing buildings, on the east and west, replace the wings of modern construction that were erected in 1813. The court and county offices occupying the old wing buildings, with the State House itself, constituted what was known for many years as the "State House Row."

The restored wing buildings are in conformity with old prints of the Revolutionary and post-revolutionary period, as can be seen from our reproduction of a cut originally printed in the Columbian Magazine of 1778.

The restored wing buildings on the east and west of the State House are two-story structures of brick, identical in style and dimensions. They are connected with the State House by intervening arcades, of three arches each, through which arches pretty glimpses of the State House yard, or "square," may be had. Original material has been used in the wings wherever possible. Walls and ceilings are white coated plaster. Staircases leading to the second floors are the original stairways where any remnants remained.

This group of buildings is heated by steam heat, indirectly supplied; the apparatus is placed in the cellars beneath the arcades.

The beautifully restored Senate Chamber, in the County building, at Sixth and Chestnut Streets, deserves a separate article. It was the work of the Pennsylvania Society of Colonial Dames, paid for by them, and carried out under the direction of Architect Mason, of Philadelphia. To this patriotic labor of love the country is largely indebted for the inspiration that finally led to the more recent restoration of Independence Hall itself, above described.

We have reproduced in connection with the photographs an old engraving from the Columbian Magazine, which shows the appearance of Independence Hall in 1778. It will be seen from this view how faithfully the work of restoration has been carried out.

The auditorium arrangement of seats which of late years has come into vogue in some of the Protestant churches of this country, appeared in many of the Lutheran churches of the seventeenth century, although the cruciform ground plan, with the pulpit at the intersection of the nave and transepts, was a favorite form.

SUBTERRANEAN LABYRINTHS AND MECHANICAL MARVELS IN THE NATIONAL CAPITOL.

Few of the many thousands of visitors who annually promenade the tessellated corridors and halls of the Capitol, and even a great majority of senators and members, have little or no conception of the busy life far down in the labyrinthine passages of the crypt, or subbasement, of this vast building. In order to reach this subterranean abode, the visitor must pass through the small room underneath the western basement stairway to the house floor, and from there descend a half-spiral granite stair, which terminates in the first of a series of whitened vaults. These are the air ducts, and appear like a network of interminable vaulted tunnels. On first entering, one is impressed with the sepulchral-like surroundings, and is forcefully reminded of the great Catacombs, or those other charnel tunnels of the Labyrinth of the Holy Crocodiles. But this momentary depression is agreeably dispelled when the visitor enters the well-lighted office of the chief engineer of the building, which appears as if hewn out of the massive rock granite walls. Here he is confronted by a series of marvelous mechanical instruments, triumphs of hygienic science, that control the great throbbing engines and machinery which furnish air, water, and light to the Halls of the American Congress.

The great windowless Halls of the Senate and House of Representatives are oppressive and box-like in appearance. It has been conceded, however, by eminent scientists that under all climatic conditions the Halls of the Capitol are the best ventilated of any similar building in the world. It is true it has cost years of experimenting and thousands of dollars in designing and altering plans and devices, but the result is a great success.

The Chief Engineer of either wing of the building stands in the relation of family physician to the respective legislative bodies, for it is his duty to take frequent diagnoses of the sanitary and atmospheric condition of the Halls and surroundings, and not only to temper the same, but also to detect and destroy the impurities in the air they breathe.

PNEUMATIC LABORATORY.

Fastened to the walls of the Engineer's office is a great variety of highly polished steam and other gauges, automatic regulators, and annunciators of the most sensitive construction, whose almost infallible exactitude keeps the engineer in charge reliably informed of every throb of the engines, the revolutions of the air-fans, and the exact measurement of temperature and volume of air passing through the tunnels; in fact, almost to the minimum of the volume of each respiration of the occupants of the Halls. These mechanical devices are automatic marvels of ingenuity and accuracy.

The great cavernous air-ducts of this subbasement are perfectly dry, and of about sixty-five square feet in dimension. They are passageways between massive brick walls leading to the flues that conduct the air to the registers in the legislative Halls and corridors of the building.

THE AIR-FAN

by means of which the volume of air is supplied is sixteen feet in diameter, and is driven by an engine of sufficient capacity. When making fifty revolutions per minute, the fan gives 50,000 cubic feet of air. It has a maximum capacity of 100,000 cubic feet per minute. The fresh air supply was formerly taken through a window in the angle of the building nearest to the fan, but more recently a granite tower about twenty feet high has been erected on the grounds west of the building. This tower is open at the top, and a tunnel connects it with the air ducts in the crypt to the large fan.

TEMPERING THE AIR.

For the purpose of heating and modifying the condition of the air, a group of iron radiators or heaters is placed horizontally across the air tunnel, thus filling the space within several feet of the top of the tunnel. A trap to regulate the passage of the air above the heater is arranged between the top of the tunnel and the radiators. The air passing between the heated tubes can be given any desired temperature, and the flow of the fresh air above the heater mingles with the heated air on the further side, and tempers it as required.

THE HYDRATING TANK.

Directly beyond the coil of heaters is a shallow tank or basin, forming a depression in the floor of, and longitudinally across, the air tunnel. This basin is filled with water, and is supplied with steam pipes for the purpose of heating it to a temperature sufficient to vaporize the same. This process hydrates, or supplies moisture to, the air, which has become dry or burnt in its passage through the heater. Care is taken that the water is not heated so as to produce steam, which would impregnate the air with an offensive odor. The air passing through the vapor thus acquires the conditions of summer humidity.

THE HALL OF REPRESENTATIVES

is 139 by 93 feet wide, and 36 feet high, with galleries above the coat-rooms, which open to the Hall. It contains an air space of 500,000 cubic feet. The seating capacity of the floor and galleries is estimated at 1,600, and the quantity of air determined upon for each individual is thirty cubic feet per minute in coldest weather, and sixty cubic feet at other seasons, making the minimum ventilation 50,000 cubic feet, and the maximum 100,000 cubic feet, per minute. The total of open space for the admission of fresh air on the floor of the Hall is about 300 square feet, and that of the galleries about 125 square feet. The total of open space in the ceiling for the discharge of vitiated air is about 670 square feet. The apertures for the admission of fresh air are in front of a continuous air passage located under the floor. The entering currents are so arranged that they encounter and neutralize each other, which causes them to assume the desired upward direction. Fireplaces were introduced in the coat-rooms and under the galleries, so that any one entering the Hall, chilled from the cold, might more quickly "warm up" than would be possible in the ordinary temperature of the Hall of about seventy degrees.

(To be Continued.)

Speaking Statues.

M. Gaston Maspéro, the well-known French Egyptologist, has recently written an interesting article on the "speaking statues" of ancient Egypt. He says the statues of some of the gods were made of jointed parts, and were supposed to communicate with the faithful by speech, signs, and other movements. They were made of wood, painted or gilded. Their hands could be raised and lowered and their heads moved, but it is not known whether their feet could be put in motion. When one of the faithful asked for advice their god answered either by signs or words. Occasionally long speeches were made, and at other times the answer was simply an inclination of the head. "Every temple had priests whose special duty it was to assist the statues to make these communications. The priests did not make any mystery of their part in the proceedings. It was believed that the priests were intermediary between the gods and mortals, and the priests themselves had a very exalted idea of their calling. They firmly believed that the souls of divinities inhabited the statues, and they always approached them with religious fear and reverence. These priests would stand behind the statues and move their heads or hands, or speak for them, never doubting that at that moment their movements and words were inspired by the divine spirit dwelling in the statues. The statues were regarded as so very much alive that in war they shared the fate of those people whose deities they were. They were taken prisoners, condemned to death, or given into slavery—in other words, placed in the temples of the conquering gods. If they were returned to their own temples they bore inscriptions testifying to their defeat and imprisonment."—Philadelphia Press.

THE KEYSTONE FIREPROOFING SYSTEM.

The remarkable development within the past ten years of internal structural steel construction for office and warehouse buildings, and the further development of fireproofing material used to protect the steel, and in combination therewith to form fireproof floors and compartments, has stimulated manufacturers of fireproofing to continually improve their product. A leading manufacturer in this line is the Keystone Plaster Company, which has had established at Chester, Pa., located on the Delaware River ever since 1887, one of the largest and best equipped mills of this character in this country, calcining 25,000 tons annually of gypsum rock, imported in their own vessels from Nova Scotia, and used in the manufacture of Keystone Fireproofing, their well-known Adamant and Victor Wall Plasters, Calcined Plaster, Paper Filler, etc. The officers are William Gibson, President; J. C. Fender, Vice-President and General Manager, and John C. Gibson, Secretary and Treasurer. Their fireproofing interests have been acquired by the Keystone Fireproofing Company, whose general office and engineering department, where all communications should be addressed, are at No. 16 South Broad Street, Philadelphia, Pa. J. C. Fender, General Manager, and F. H. Albright, Engineer. They have selling offices at Room No. 912 Exchange Court, No. 52 Broadway, New York, and at Sixth Street Wharf, S. W., Washington, D. C. The company will prepare plans and make estimates for any part, or the fireproofing throughout of buildings for any purpose, including floors, roofs, partitions, girder and column protection, all set up in place, or for the material only.

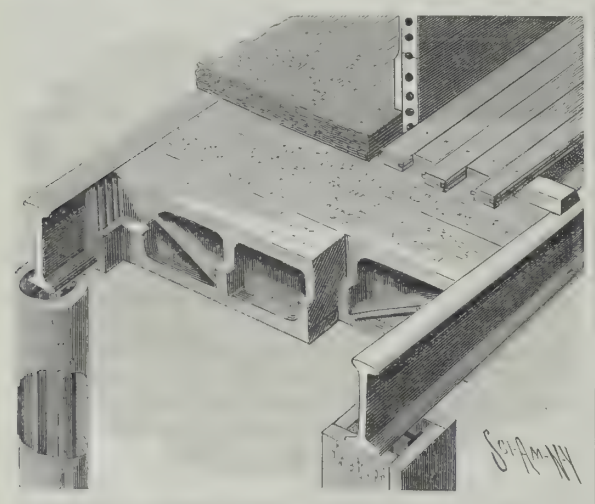
Of the Keystone fireproofing system, it should be noted that calcined plaster (calcined Nova Scotia gypsum), with an incorporated fiber in a block form, has been extensively used in both this country and Europe for many years for fireproof partitions, column and beam protection, on account of its lightness in proportion to its strength, its facility in erection, and its non-conductivity of heat.

The Keystone fireproof floor is made of a grade of this material that develops the highest tensile strength. As shown in the engraving, it consists of two haunches molded to the exact section of the steel floor beam, giv-

ing greater bearing and stiffness than any other form of fireproof floor. It has a two-inch flange, thoroughly protecting the underside of the steel floor beam, and containing an embedded metal web which causes it to with-

TESTING THE BREAKING STRENGTH OF A SECTION OF KEYSTONE LINTELS.

stand the rough handling of transportation and setting, or any abrasion from the severe hydraulic impact of a water tower hose stream in event of fire. The material being not only fireproof like burnt clay, *i. e.*, brick or terra cotta, but also one of the best non-conductors of heat, it fully protects the floor-beam from deflection



KEYSTONE FIREPROOFING LINTELS AND HAUNCHES.

or failure by fire, which burnt clay, being a ready absorber of heat, will not do.

These haunches carry the floor lintel, as shown in the small engraving, the load bearing directly down, and the absence of side thrust removes any occasion for tie rods. An embedded metal web as indicated gives high resistance to tension (all loading tests having demonstrated the ability of the floor to carry on average spans, with proper factors of safety, heavier loads than the steel beam supporting it), and as in the case of the haunches prevents abrasion from a fire stream. The soffit of both lintel and haunches being grooved and on a level gives a perfectly flat even surface, requiring but a light coat of plastering to give a true plastered ceiling, with no beams or other work showing below the ceiling line. Terra cotta floor arches generally have a camber which requires considerable material to fill to make a level ceiling, and almost all other fireproof floors require the stretching of wire lath on the underside of floor when a flat ceiling is desired. The uprights in the lintel have offsets, which interlock and cause a load applied at any one point to be distributed through the bay. The haunches being of sufficient length to receive the abutting ends of several lintels, so that, after the lintels are in place, the whole is cemented well together by the pouring of an approved cement grout in the holes made by the grooves in the face of the haunches as shown, the whole floor becomes a single unit. The small half-tone engraving shows the method of lowering a lintel into place, with the key-shaped haunches attached to the steel beam. It is finished in any of the usual ways, by embedding wooden sleepers in a cinder concrete and using a wood finishing floor, or by a concrete faced with cement, tile, or marble.

The floor is lighter than any other of equal strength, giving marked economy of structural steel, and of less cost than any affording a flat ceiling.

The system includes roofs and mezzanine floors of similar but lighter construction, false ceilings, girder protection of any form, column protection, either square or round, of similar material as shown. Also Keystone fireproof blocks are made in sizes on the average of 12 by 48 inches, of any required thickness; these, when set up with any reliable hard wall plaster, makes a fireproof as well as soundproof partition, unequaled for lightness and durability.

The partitions of many of the largest office buildings and apartment houses of New York, Philadelphia, and elsewhere are of this material, much of which has been in place and has withstood severe usage for a number of years, and it is now being specified by leading architects for others.

An idea of the partition block will be seen in the small engraving, as well as the method of covering steel columns, and, when given a light coat of plastering, is complete.

In a recent test of this fireproofing material for strength and fire resistance, made at the company's works at Chester, Pa., in presence of Mr. G. D. Hiscox, Consulting Engineer, and of other architects and engineers interested in improvements in fireproof building materials, a section of three lintels, each 7 inches wide by 7¼ inches deep, was placed between and bearing upon haunches of the same material, on the lower flanges of 6-inch I beams, 5 feet between centers, and subjected to a uniform load by piling bags of sand upon it until a load of 7,100 pounds, or 811 pounds per square foot, was reached without signs of breakage; a further load of 880 pounds per square foot was found to be the breaking limit. In our illustration the lintel will be seen beneath the bags. Observation before breaking found a deflection in the 5-foot span, with a load of 800 pounds per square foot, to be only ⅛ of an inch.

As the test floor was only set in a temporary form, without being grouted or cemented together, the result was below what might have been expected from a permanently constructed floor.

A drop, or impact, test was made on three lintels placed together, 9 inches each in width by 11¼ inches in depth, set between 10-inch steel I beams, 5 feet between centers. A bed of sand, two inches thick, was spread on the surface of the three sections, and an oak beam, weighing 300 pounds, was dropped endwise a distance of 6 feet as near the center of the section as possible, resulting in the fracture of two of the lintels. This was equal to a blow of 1,800 foot-pounds, or, as estimated, an impact of 10,000 pounds.

With the conditions of temporary erection similar to the first test, this was considered a satisfactory result; while, if the lintels had been permanently installed, and had the advantage of the resistance of abutting floor bays, the result would have been much higher.

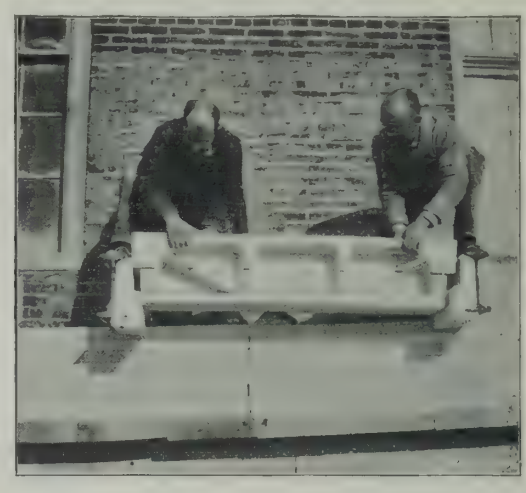
A fire test, as shown in the larger illustration, was made of a floor over a brick room, 12 by 10 feet, by 10 feet high, with a flue at each upper corner to insure even distribution of heat; there was a large grate upon the floor, and an ashpit beneath to enable continuous firing.

The test floor was made with a 10-inch I beam at each side and one in the center, forming two floor bays, 5 feet span by 12 feet long, filled in with the fireproof lintels 11¼ inches deep, level with the top of the beams, and extending 1¼ inches below. The ceiling was plastered in the ordinary manner.

A filling two inches thick was spread on the top, and the floor then loaded with brick to 224 pounds per square foot on one bay, the other being loaded to 340 pounds per square foot.

The inner walls were lined with fireproof slabs 4 inches thick and plastered. A small door in front for feeding the fire, and an aperture in the outer wall near the ceiling for inserting a pyrometer, completed the arrangements for the fire test.

At 1.30 P.M. the fire was started, and at 2 P.M. the pyrometer indicated 2,225 degrees Fahrenheit. The fire was maintained for three and one-half hours, when the pyrometer indication had crept up to 2,500 degrees Fahrenheit, at which time the ceiling and inside walls were at a full red heat. The upper outside surface of the floor had become only slightly warm to the hand in a space left open under the brick load.



LOWERING LINTEL INTO PLACE.

A fire stream was then turned on to the inside of the room, and up against the ceiling and walls, until they were cool enough to allow of inspection.

The plastering had fallen off from the fireproof ceiling and walls by the action of the fire and water, leaving the underside of the lintels intact, as also the lips of the haunches covering the underside of the steel beams; in fact, the ceiling appeared to be ready for replastering after a few hours' drying.

The wall blocks of Keystone fireproofing remained in place, the plastering only having fallen off.

The tests all proved satisfactory, and in some points surprisingly so, as in fire resistance and load bearing, especially when it is remembered that the floor tested gave perfect protection to the underside of the beams, it being but 1¼ inches thick, while the regular forms of floor lintels give 2 inches protection below the bottom flange of the beams.

A FIRE TEST OF KEYSTONE FIREPROOFING LINTELS, 2500° F.

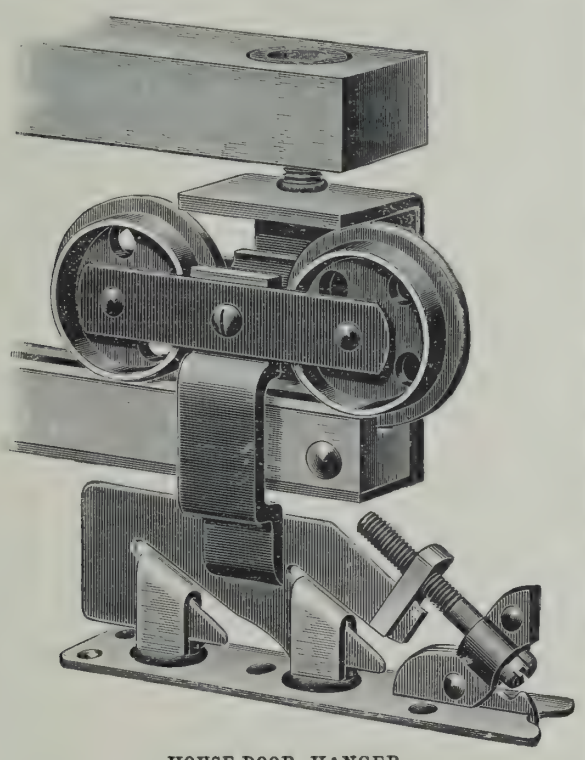
Steel Ceilings and Walls.

WITHIN recent years the steel ceiling has become widely used in many of our public buildings and private dwellings. But the beautiful artistic effects which can be obtained with properly worked metal have not alone been instrumental in bringing about this result. Largely because steel constitutes the most effective of all safeguards against fire have the architects of our buildings employed these ceilings and walls in their structures. Among the most prominent manufacturers of steel ceilings and walls may be mentioned H. S. Northrop, of 41 Cherry Street, New York city, from whom further information regarding the use of metal in buildings can be obtained.

FROM the Rider-Ericsson Engine Company, of New York, N. Y., we have received two very neatly printed and illustrated catalogues describing their various engines and pumps. The one catalogue—"A Dialogue Reported for the Benefit of Searchers for Pumps that Pump Every Day in the Year if required"—is especially interesting, inasmuch as it presents its matter in a most attractive form.

LE ROY HANGERS.

THE Le Roy noiseless, ball-bearing, house-door hanger is an improved device made by the Wilcox Manufacturing Company, of Aurora, Ill. For heavy, self-closing doors, the ball-bearing hanger may be said to be almost indispensable; because without it, that ease of operation cannot be obtained which is required in very large doors.



HOUSE-DOOR HANGER.

The accompanying illustration representing a Le Roy hanger, having an adjustable track, will save us the necessity of giving an extended description of the construction.

The company will be pleased to send to any address a well-printed catalogue describing their products.

THE MCCABE HANGER MANUFACTURING COMPANY, of 532-542 West Twenty-second Street, New York city, have sent us a neatly printed and illustrated catalogue, describing the McCabe ball-bearing door-hangers and expansion bolts. Among the new devices which find a place in the catalogue may be mentioned a novel means for hanging fire-doors, a new expansion bolt, and a very simple chain-riveter which will be of interest to bicycle riders and to the proprietors of bicycle supply stores and repair shops.

THE INTERNATIONAL HEATER COMPANY, of Utica, N. Y., recently moved into a handsome new building, in which they will enter upon a new career of prosperity. The building is fitted throughout with all the improvements which the architect's ingenuity could devise, and is well adapted to the needs of so busy a firm as the International Heater Company.

AN INGENIOUS SYSTEM FOR PREVENTING THE BURSTING OF PIPES.

THE bursting of pipes and water-mains during cold weather has always been a source of destruction as well as of danger.

The prevention of this bursting and consequent injury to property has engaged the attention of many an ingenious mind. Among the methods which have been devised to render pipes safe in cold as well as in warm weather, may be mentioned a most simple and ingenious system which is now being introduced by the Pneumatic Dome Manufacturing Company, 502 E Street Northwest, Washington, D. C.

The system in question depends solely upon cushioning the pipes at intervals with air, by means of pneumatic domes having inclined planes or slopes, opposite the mouth of the storage-dome. These ice-planes in

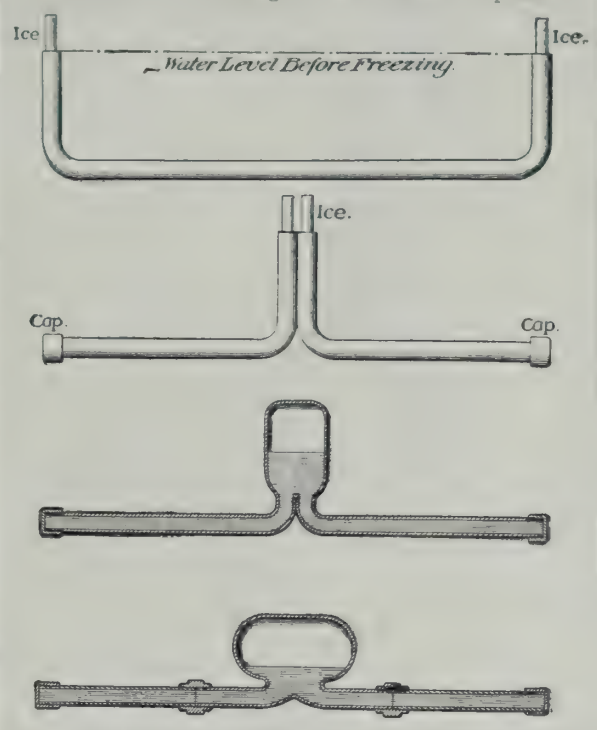


FIG. 1. THE DEVELOPMENT OF THE PNEUMATIC DOME.

combination with an air-chamber are the result of lengthy experiments with confined ice. The fittings of the system are metal, and permit the freezing of the pipes any number of times without bursting. The frozen pipes to which these fittings are attached will be immediately ready for service upon thawing out, thus avoiding not only all expensive repairs, but also preventing the destruction of property which would otherwise result.

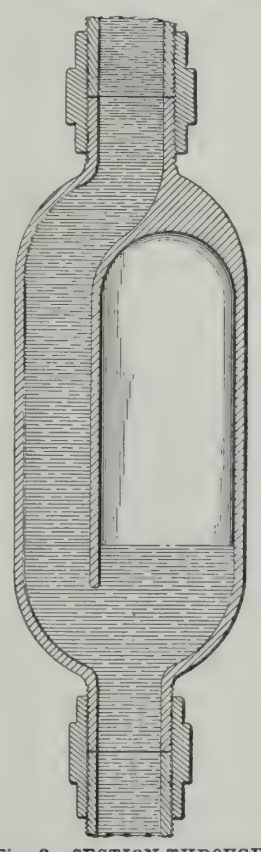


Fig. 2.—SECTION THROUGH A VERTICAL DOME.

Fig. 1 illustrates the early laboratory experiments made by the inventor of the pneumatic system, and shows the various steps in the development of the air-dome. The curving to right angles of the pipe at the center, as depicted in the middle figures, is displaced by the gentle double slope ndicated in the last diagram. This double slope or set of inclined planes, slides the ice at the instant of freezing into the air-dome, which relieves the pipe to which it is attached of the usual destructive strain.

The dome for vertical pipes, shown in Fig. 2, like the horizontal form illustrated in the last sketch of Fig. 1, provides cushioned storage-room for the increased bulk due to freezing. Here the column of ice in expanding thrusts its end longitudinally into the air-dome without the necessity of being deflected. These vertical domes, like the horizontal types, are screwed to the pipes by ordinary screw-couplings. Domes of this form are inserted into the pipe every ten feet on a long stretch, and on every exposed vertical run of less than ten feet.

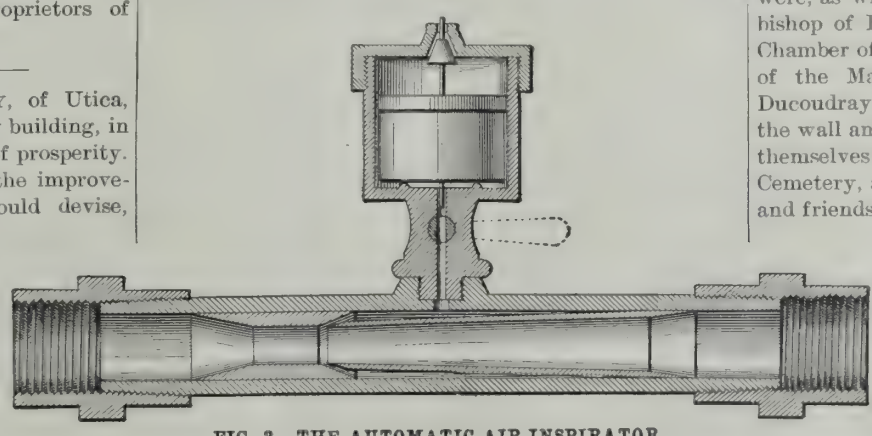


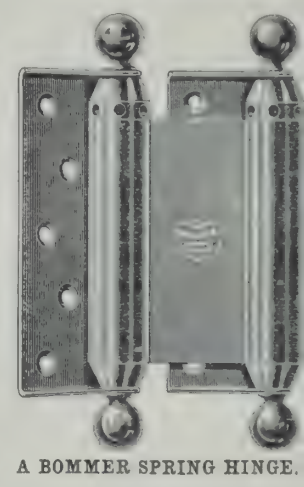
FIG. 3. THE AUTOMATIC AIR-INSPIRATOR.

Each system of pneumatic domes for the protection of any length of exposed pipe is provided with an automatic air-inspirator or governor. The operation of this device can be best explained by referring to Fig. 3. With a flow of water from right to left (in the illustration the governor happens to be turned in this way) air is drawn through the little valve at the top, by reason of the vacuum produced about the nozzle portion of the inspirator, and is forced into the water, and is thus carried along over the system of pipes. When the flow ceases, the water rises with the pressure into the cylindrical top, causing the cylindrical float to push up the little valve into position to stop immediately any outflow of water. As the injector works only when the lower spigots are open, owing to the back pressure of the water column running to the upper floors, just sufficient air is furnished to keep the domes filled. The air which has been automatically drawn in at the basement, is carried to the upper floors of the building simply by the natural flow of the water when the upper spigots are closed.

The pneumatic system, apart from preventing the pipes in a building from bursting in cold weather, also renders the water flow steady under all conditions, and does away with the annoying "hammering" of the water within the pipes when the spigots are opened and closed.

MR. E. T. BARNUM, Detroit, Mich., is at present issuing his regular spring editions of various catalogues, illustrating and describing a wide assortment of ornamental iron, wire, and brass work, builders' wire and iron work, iron and steel fencing, jail-cells, bank and office railings, vases and lawn furniture, and cemetery vault-doors and gates. The catalogues will be sent upon application to any of our readers.

SPACE in factories is valuable. The time of employés is likewise valuable; and if a moment can be saved on things which are frequently done in the course of a day, the net result during the year amounts to many hours. For example, if there are a number of doors which swing only one way, time is wasted in stopping to pull the door open, leaving only one hand free for carrying anything; whereas, if double-acting spring hinges were used, a mere push with the foot would suffice to open the door when coming or going in either direction, leaving both hands free for carrying, and thus saving the time of employés who have occasion to pass from one room to another.



A BOMMER SPRING HINGE.

Hinges of this type are made by Messrs. Bommer Brothers, of 351-353 Jay Street, Brooklyn, New York city.

A New Coating,

WHICH is said to successfully protect posts and other timber surrounded by earth from rotting, is given by the Baugewerkszeitung. Take resin, 50 parts, finely crushed chalk, 40 parts; fine white sharp sand, 500 parts; linseed oil, 4 parts; native red cupric oxide, 1 part; and sulphuric acid, 1 part. First heat the resin, the chalk, the sand, and the linseed oil in an iron kettle, then add the oxide and the sulphuric acid with caution, mix everything carefully, and paint the wood with the hot mass, using a strong brush. If the mixture is not liquid enough, it is diluted with a little linseed oil. When the coating is dry, it forms an extremely hard varnish, which allows no moisture to enter.

Memorial of the Martyrs of the Commune.

SOME time ago the Paris Municipal Council decided to pull down La Roquette Prison, and erect large dwelling houses upon the site. No one objects to the disappearance of the building, but a movement is on foot to preserve at least the wall associated with the murder of the hostages by the Communists in 1871. These hostages were, as will be remembered, Monsignor Darboy, Archbishop of Paris; M. Bonjean, President of the Petitions Chamber of the Court of Cassation; the Abbé Deguerry of the Madeleine Church, and Fathers Allard and Ducoudray, two Jesuits. They were placed in front of the wall and shot by the Communists, the as Communists themselves were placed against a wall in Père Lachaise Cemetery, and shot by the Versailles troops. Relations and friends of the hostages, and a large number of other French citizens, demand that this wall in La Roquette Prison, against which the innocent hostages were placed for execution, shall be preserved, as is the wall in Père Lachaise Cemetery, at the foot of which the Communists fell. Ever since the Commune, and especially after the amnesty granted to the Communists, the wall in the cemetery has been the rendezvous for revolutionary agitators, and many years ago a marble slab bearing the names of the Archbishop and the other hostages was affixed to the fatal wall of La Roquette Prison. On it is written: "Respect this spot, which witnessed the death of the noble victims of the 24th May, 1871." The movement to preserve the memento includes the sons of President Bonjean and many influential persons, and is expected to be successful.—N. Y. Evening Post.

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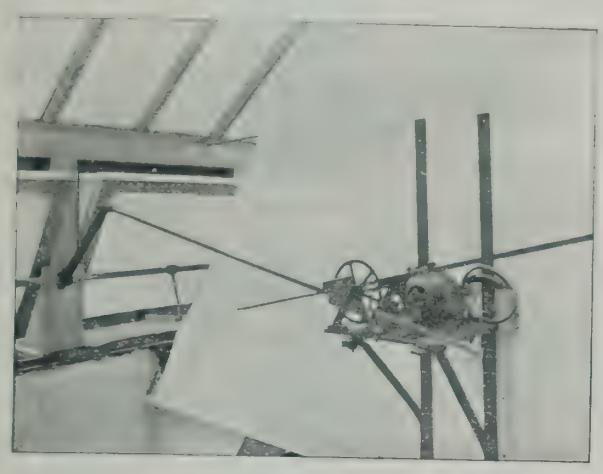

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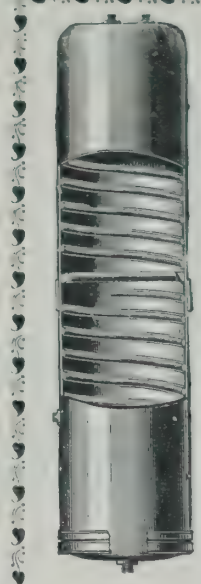

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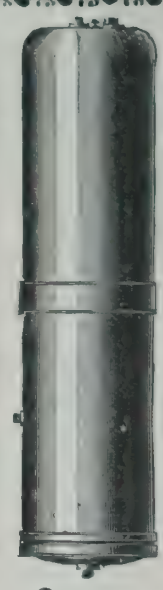

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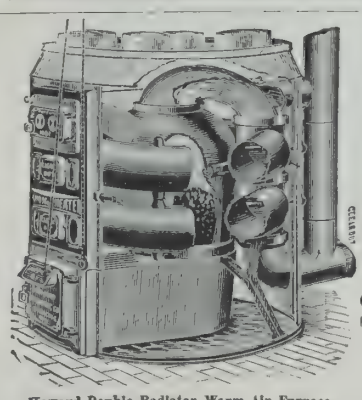

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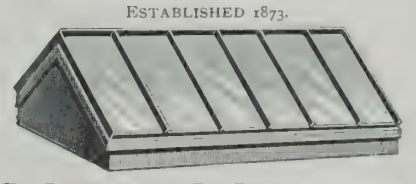

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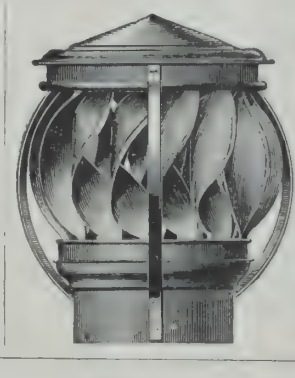

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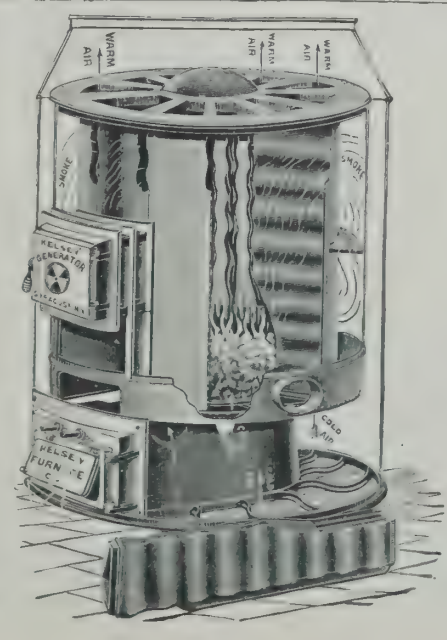

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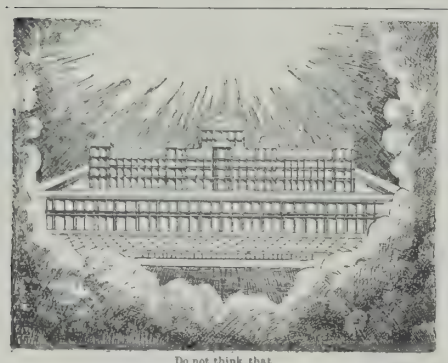

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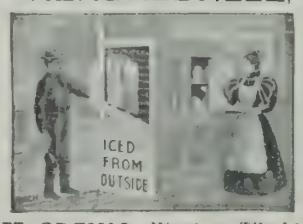

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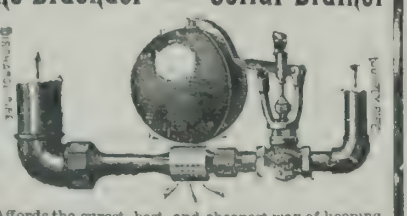

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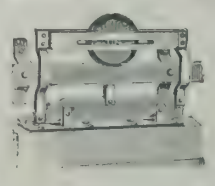

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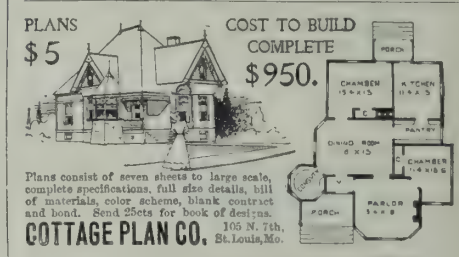

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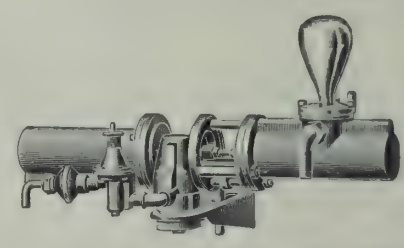

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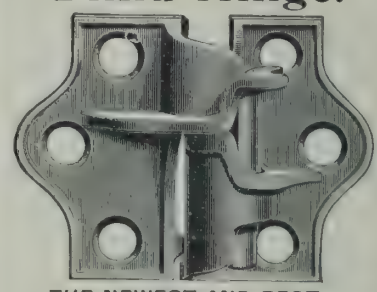

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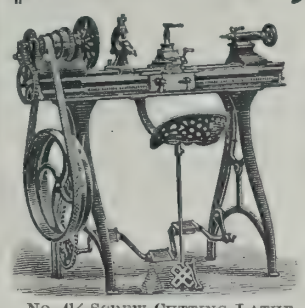

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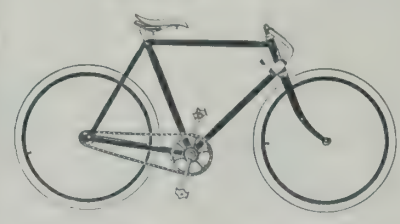

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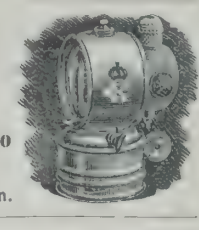

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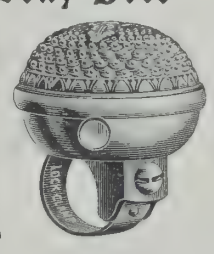

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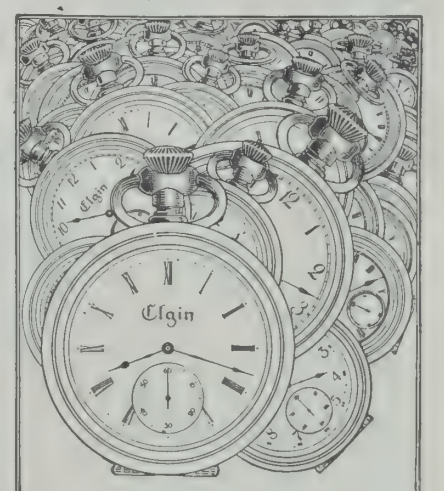

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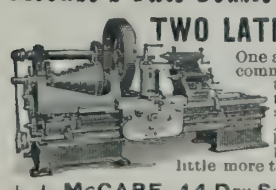

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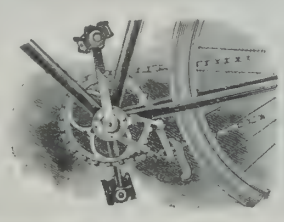

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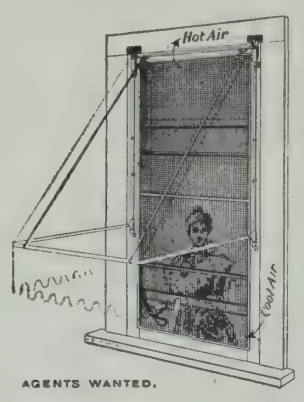

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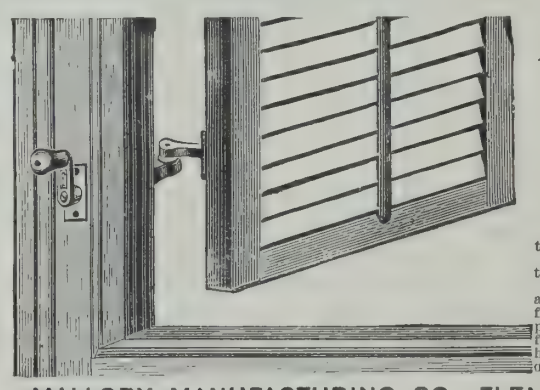

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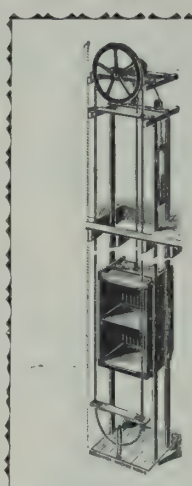

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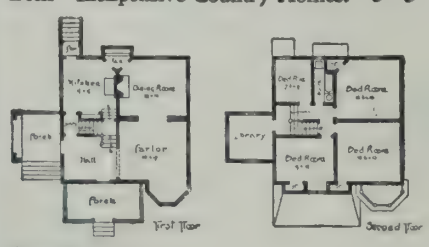

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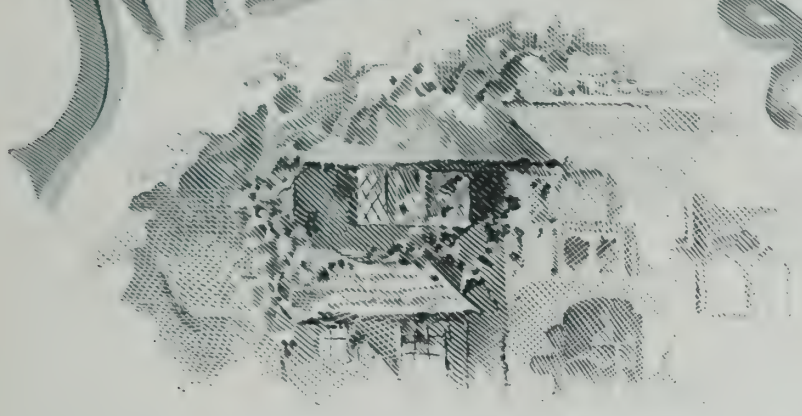

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THE HOUSE OF ST. ANNE, IN GOSLAR.—See page 3.

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A GERMAN VIEW OF AMERICAN ARCHITECTURE.

FROM time to time we receive from a firm of German publishers livraisons of Paul Graef's "Neubauten in Nordamerica." It is a handsome publication, which, when completed, will have one hundred excellent engravings of prominent buildings, houses, etc., in America. The Berliner Tageblatt recently had some interesting comments on this book. It notes the practicality of the American buildings. The qualities that so often come to the front in German buildings—straining for effect, overloading with ornamentation and strangeness—are entirely lacking. "Most of us," remarked a German architect recently, "build not a house, but a poster for our building business." For this reason the decoration goes beyond the limit of what is necessary in good taste. The writer goes on to say that the American architects lay all the stress on the thing done, and none at all on exploiting the person who does it. This is quite true, for we do not believe that there is a profession in the world where self-advertisement is kept within as narrow limits as among architects, and as a body of professional men they are most modest.

In the next place, admiration is called forth by the originality of each house. Its individuality is gained only through the fact that its form is determined in each case by its interior arrangement, and nothing is built for the sake of the façade.

In the third place, the observer is struck with the way with which delicate decorative elements of old periods are utilized. The builder is never under the sway exclusively of one old style. Antique art is not something that we must accept in its entirety, and whose style we must copy with scientific accuracy. On the contrary, it is the same with American architects as it was with the artists of the First, or Early Renaissance—a treasure of motives from which he can draw at will. German architects are castigated for their slavish adherence to old styles, and American architects are complimented for the way in which they adapt styles to their purposes. The admirable use of material is noted by the German critic, and the use of hewn stone is especially instanced. The German critic does not think that our models are to be copied, but thinks they should tend rather to stimulate design according to the need predicated by each building, according to the material at hand, and, of course, with deference to the national taste. The American designs tend to show the Germans how great the possibilities are in such a procedure. How much genuine richness lies in following it, rather than in exaggerated bedizenment with superfluous ornamentation! It is interesting to know that our architectural designs are thought of so highly in Germany.

"THEY ORDER THIS MATTER BETTER IN FRANCE."

STERNE was not so far wrong when, in the "Unsentimental Journey," he used the words which form the caption of this article. Two chimneys were needed for the boilers which furnished the steam for the engines which are to supply the power for the Exposition next year. Instead of giving the contract at once to engineers and contractors, a competition between French specialists was instituted, and the general conditions of the competition were made. The chimneys are to be between 230 and 260 feet in height, and the internal diameter is to be nearly 15 feet. The monumental aspect of these chimneys must be in harmony with the splendid setting in the Champ-de-Mars. The system of decoration was entirely left to the choice of competitors, but it was stipulated that the construction must be entirely in brick, and naturally a large part of the decoration must also be brick or terra-cotta. A prize of $400 was also offered to the author of the best system of illumination. A month's time was offered to enable the competitors to present their *projets*. The competition is of great interest on account of the novelty of having the competitive plans for what we are apt to consider the most utilitarian of things—the chimney. Ten men were admitted to take part in the competition. They presented eighteen *projets*, and, after an exhibition of the drawings had taken place for some days, the jury handed in their decision, which awarded the prize to MM. Nicou and Demarigny. The jury considered that for constructive value and architectural beauty their design was the best which was submitted. Some of the types of chimney offered were most interesting. One man proposed a Gothic column, somewhat resembling a pier of a cathedral; another proposed an Egyptian column, surmounted by a campanile and flanked by four metallic pylons carrying luminous globes. Another sketch called for symbolic treatment of coal, flame, and smoke. Designs of this nature are not of much value, however; for, if we must have chimneys, let us have designs which will be beautiful, and at the same time will fulfill their function of taking away smoke and gases. The design accepted consists of a twelve-sided base, with specially recessed panels, separated by a kind of pilaster; then comes a cornice and fillet; then, where the tapered shaft proper begins is a ceramic decoration composed of acanthus leaves; above this is a reticulated pattern, and, finally, handsome escutcheons and decorative work in vitrified enamel. The top of the chimney is surmounted by a crown, which is also treated in vitrified enamel.

HIGH BUILDING WATER TEST.

THE ability of a fire department to force water to the roof of the modern building of eighteen or twenty stories in sufficient quantity to extinguish a big blaze received its first trial a few weeks ago at the St. Paul Building, corner of Broadway and Ann Street, New York city. The test took place at 6 A.M., and was witnessed by a number of interested parties, including, of course, Mr. Bonner, the then chief, and a number of firemen. On the roof of the building, 317 feet from the ground, were deputy-chiefs, battalion-chiefs, representatives of the architect, owners, etc. It should be said that the St. Paul Building is provided with a standpipe which runs from the basement to the top story of the building. Two 3½-inch lines were connected to this standpipe by a Siamese coupling. A water gauge was attached at the top of the building. After the signal to pump was given, the hose on the roof began to fill with water, and a level stream was projected through the air across Broadway, over St. Paul's Church, and fell in the churchyard beyond, a distance of 250 feet. The water pressure had been diminished two-thirds in its climb of 317 feet, so that the gauge registered only sixty pounds. The pressure was ordered to be increased, but before it could be obeyed the water stopped spouting from the nozzle and the hose collapsed. This was caused by a break in the standpipe on the thirteenth floor. The water poured down the elevator shaft and flooded the engine-room in the cellar. It was found on investigation that there had been a flaw in the cast-iron coupling of one of the joints of the standpipe. It was particularly unfortunate that the test had to be abandoned, as the test was one of great importance.

A few weeks later the Fire Department conducted other experiments of the same nature: one at the Dun Building, and the other at the St. Paul Building, again. This latter test was under the supervision of Acting Fire-Chief Croker, Fire-Chief Bonner having retired during the time which elapsed between the two experiments. The first test was throwing a stream from the roof. The second test was the use of branch lines from the windows of the building. Both were successful. The tests showed that two of the large engines can draw sufficient water from one hydrant to fight a fire. With 250 pounds pressure at the engine and 75 pounds at the roof, the stream was thrown from a 1¼-inch nozzle from the roof of the office building across Broadway onto the roof of St. Paul's Church. The next experiment was to run lines from the valves on the standpipes on some of the floors, from the eighteenth to the twenty-fifth floor. These lines were run to the windows on the Broadway side. Two engines were attached to the standpipe, but one was stopped after the test began, as the two pumped water faster than they could find an outlet. All three of the tests were successful, and show that the Fire Department of New York, at least, can force water to the top of the highest building, and by the use of the standpipes almost any fire could be fought, even if auxiliary plants were inoperative or destroyed. In many of the great buildings standpipes have been omitted. The Fire and Building Departments will now undoubtedly require them to be attached to all buildings of any great height.

LANDSCAPE GARDENING FOR WOMEN.

IT has been suggested that landscape gardening affords a field for women, and there is no doubt that they would be successful in a small way, even if they did not undertake the planting of large places. Women are naturally expert gardeners, and have an excellent idea for color, and, all things being equal, the average woman can pick out a view much better than the average man, so it is fair to suppose that they would make excellent landscape gardeners, if they did not become landscape architects and lay out palatial gardens and parks. It is a comparatively new study in America, and is not one which cannot be very well taught. To be a successful landscape gardener requires a certain knowledge of botany and forestry, and a considerable knowledge of the literature on the subject. These, combined with good artistic sense, will tend to make the successful landscape gardener.

TO MOVE BUILDINGS IN BUDAPEST.

A CHICAGO company is to undertake modern building moving methods in Europe. This company has closed contracts for changing the location of nine structures in the city of Budapest, Hungary, where grading and reconstruction of the street system have been found necessary. The American system of building removal was unknown, but the Government engineers began investigations, which ended in American engineers being invited to bid on the moving of public and other structures.

IMPROVING THE CONDITION OF WORKING-PEOPLE.

THE American Architect chronicles the annual competition for essays inaugurated by the Société Industrielle of Amiens, one of the most vigorous and effective bodies of its class in the world. The annual competition is for essays or other works calculated to improve the condition of the working-people. The rewards in most cases are gold medals. One of these is offered for the best plan for a workingman's house for a family of four to six persons, to be built in the neighborhood of Amiens, forming a part of a group of similar houses, to cost not more than $600 above the cost of the land. Other gold medals are offered for a system of artificial lighting applicable to private houses and factories, and superior to anything yet in use; and the third is for a good system for purifying water for household use. Many other medals are offered for other subjects, such as political economy, etc. It would be interesting to have a competition of this kind frequently in the United States. Similar competitions are held from time to time, but with no great frequency. The cost of holding them is not excessive, and the results are of great value.

A RESIDENCE AT WORCESTER, MASS.

THE engravings presented on page 15 in this issue illustrate a residence recently completed for Mr. J. E. Farwell, at Worcester, Mass. The design presented is attractive in appearance, and it has many excellent features, including the cobblestone work at front, the tower, and bay windows. The underpinning is constructed of cobblestone, same as at front porch. The building above, of wood, is covered on the exterior with clapboards and shingles, painted a greenish gray, with trimmings of Colonial white. The blinds are painted bottle green. The roof is covered with shingles and stained a dark green. Dimensions: Front, 33 ft.; side, 45 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The interior plan is most excellently arranged. The vestibule is trimmed with quartered oak, with red birch floors. The hall is trimmed in a similar manner, and it contains an ornamental staircase, turned out of oak, and inclosed with a buttress, strong turned balusters, and square paneled posts. The parlor and sitting-room, of good dimensions, are trimmed with quartered red sycamore, and the latter contains an open fireplace, trimmed with tiled facings and hearth, and a mantel made from a special design. The opening between parlor and sitting-room is provided with round columns with paneled pedestals. The dining-room is also trimmed with quartered red sycamore, and it contains a china cabinet built in. The windows in this room have transoms of ornamental leaded glass. The kitchen and its dependencies are trimmed and wainscoted with hard pine, finished natural, and it is provided with all the modern improvements. The floors are laid of hardwood. The second and third stories are trimmed with whitewood. The second floor contains four bedrooms, sewing-room, seven closets, linen closet, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage room. The house is piped for gas lighting, and wired for electric, gas and incandescent lighting. A cemented cellar contains furnace, laundry, and other necessary rooms. Cost, $5,000, including everything complete. Messrs. George and J. P. Kingston, architects, Worcester, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

THE HOUSE OF ST. ANNE, IN GOSLAR.

A SINGULAR mixture of the ecclesiastic and the secular in architecture is to be found in the House of St. Anne (St. Annenhaus), in Goslar, a hospital which, according to an inscription* on a tablet dated 1696, was erected in 1494, as a refuge for the poor and sick.

We give exterior and interior views on page 1 and below. As it now stands the building has retained only partially its original form. The choir and a part of the outer wall are the sole stone portions left of the old structure, the rest being woodwork. In 1716 a restoration was begun, during which much of the present framework was built. Probably the rectangular windows in the choir-walls, with the painted escutcheons bearing the date 1649, were also built at the same time.

The mixture of secular and ecclesiastical already referred to is especially noticeable in the chapel. Upon the railing or partition which surrounds this chapel are placed small wooden statues of saints, among which may be recognized St. Stephen, St. Peter, St. Mary, and St. Anne. Above the entrance is an old crucifix, representing the Christ with feet not crossed, but placed side by side. On the central pillar is a cross, on the ends of which the four signs of the Evangelists are inscribed.

The pulpit canopy of this chapel is most remarkable. Upon the thirty-two square fields of which it is composed are embroidered scenes from the life and martyrdom of St. Gertrude. Emperor Frederick, after having visited the chapel in 1875, gave orders to have the canopy edged with blue silk and repaired. The rafters of the chapel are ornamented with large scrolls, painted in white and yellow upon a light blue ground. The previously mentioned figures on the railing are also colored.

In the rear of the building is the kitchen, which still has the old hearth, and the quaint chimney, supported by two round arches. Some old pieces of furniture, among them a table, closets, and chests of considerable age, may here be seen. On the exterior of the kitchen is an old walled-up Romanesque window, divided into three spaces by two pillars. Next to this window is set up a recently unearthed tombstone of a knight of the fourteenth or fifteenth century.

* Anno domini nostri Jesu Christi 1494 imperante Maximiliano I. hoc hospitale in dei Gloriam in S.S. Annae et Gertrudis honorem pauperibus et infirmis in Solatium et Adjutorium erectum ab Henrico et Conrado Geismar, fratribus germanis civibus Goslariensibus, et ab Alexandro VI. Romae confirmatum duravit jam annos 222.

Upon the high slate roof of the house a small tower has been erected, in which hangs a bell.

The restoration of the building has been carried out by Architect Wolkenhaar, who has adhered as closely as possible to the general form of the original structure.—Blätter für Architektur und Kunsthandwerk. Verlag von Julius Becker. Berlin. SW.

A MODERN RESIDENCE AT MOUNT VERNON, N. Y.

THE engraving shown on pages 6 and 7 in this issue illustrate a modern residence, which has been erected for Mr. Arthur D. Stone, at Mount Vernon, N. Y. The design is admirable, and the interior is most attractive and pleasing. The building is treated with Colonial detail. The underpinning is built of red brick, laid in red mortar. The superstructure is sheathed, papered, and then covered with narrow clapboards. It is painted a deep dull red color, while the trimmings are painted cream white. The gables are shingled and treated similarly. The roof is covered with shingles and stained a moss green. Dimensions: Front, 30 ft.; side, 56 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The vestibule is trimmed and wainscoted with quartered oak. The main hall is unusually attractive. Its connection with library is a most excellent feature, while the grouping of the columns and pilasters rising up and supporting the beamed cornice are also good features, giving the impression of one large room with arcaded effect. The main hall has a paneled seat and broad staircase, with handsomely turned newel, posts, and rail of oak. The woodwork in this hall and library is painted a dark bronze green. The library contains an open fireplace built of Dutch buff brick with mottled effect, and provided with mantel handsomely carved, and furnished with columns and mirror. The reception-room or parlor is a happy combination of the French and Colonial style. The woodwork is treated in ivory white, and it has a wood cornice, and an open fireplace built of Roman brick and facings, and hearth of same. The mantel, of old Colonial style, is neatly carved, and is of handsome design. The dining-room is trimmed with oak. It is octagonal in form, and two of the corners are formed by china cabinets being built in, with leaded glass doors. The kitchen, pantries, and rear hall are trimmed and wainscoted with white pine and then painted. These apartments are furnished with all the best modern conveniences. The second floor contains four bedrooms and bathroom, trimmed with white pine, treated natural. The bathroom is paved with unglazed tiles, and wainscoted with white enamel tiling. It is fitted up with porcelain fixtures and exposed plumbing. The third floor contains two bedrooms and two trunk rooms. The cellar, cemented, contains furnace, laundry, and other necessary apartments. Messrs. Cable & Lucas, architects, No. 1183 Broadway, New York city.

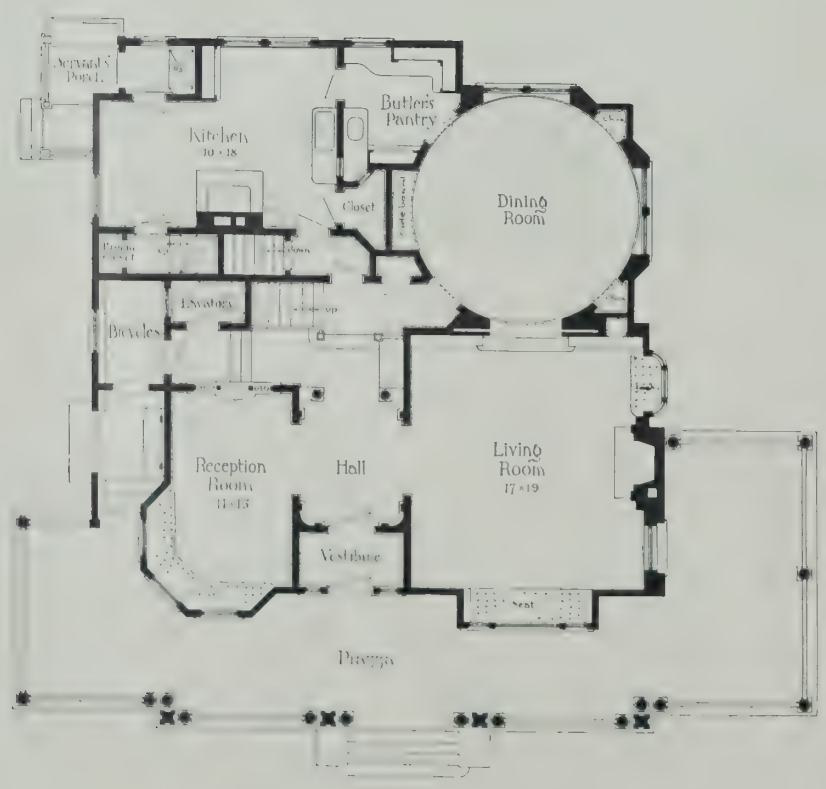
Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN RESIDENCE AT BRIDGEPORT, CONN.

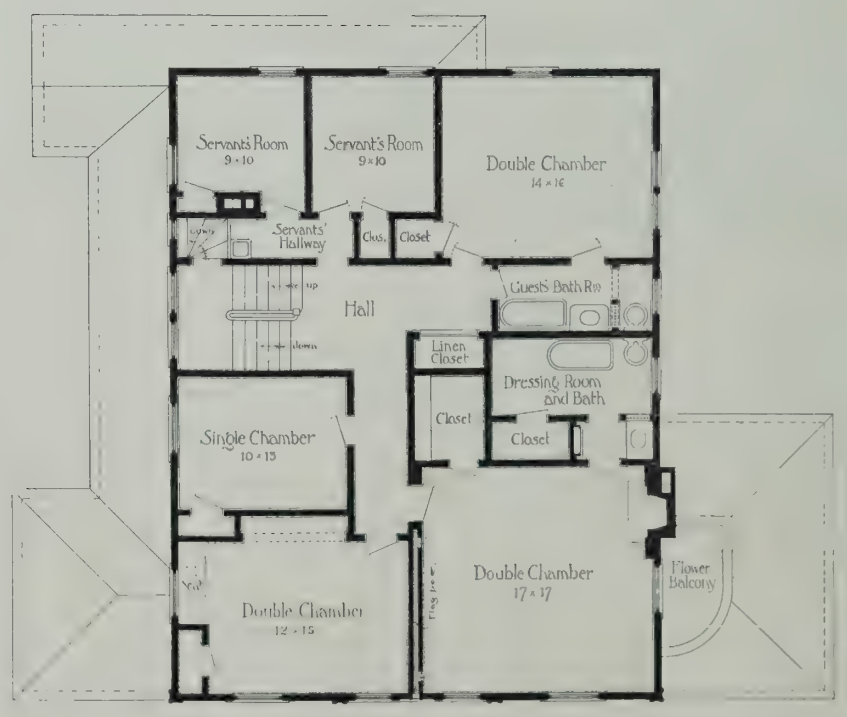
THE engravings on page 13 in this issue present a design for a modern residence which has been erected for Messrs. Marsh Bros., Builders, at Bridgeport, Conn. The exterior lines are well broken by swell bay windows and piazza, and the roof by ornamental dormer windows. The underpinning is built of rock-faced bluestone of a bluish gray color. The exterior framework is sheathed, papered, and covered with clapboards, painted light yellow, with white trimmings, and the blinds are painted bronze green. The roof is covered with shingles and stained a moss green color. Dimensions: Front, 28 ft.; side, 33 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 9 ft.; third, 8 ft. The interior is trimmed throughout with ash. Hardwood floors in hall, dining-room, and bathroom. The hall contains an ornamental staircase, with newels, posts, and balusters turned out of ash. The parlor and sitting-room are separated by sliding doors; the latter has an open fireplace, with tiled hearth and facings, and mantel of oak, with mirror and columns. The dining-room, of good dimensions, has a china closet built in, with leaded glass doors. The kitchen, pantry, and rear hall are wainscoted and trimmed with North Carolina pine, and are furnished with the best modern conveniences. The second floor contains four bedrooms, with large closets, den, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains one servant's bedroom and ample storage. A cemented cellar contains furnace, laundry, and other necessary rooms. Cost, $3,500, complete. Mr. A. H. Beers, architect, P. O. Arcade, Bridgeport, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

THE CHAPEL OF THE HOUSE OF ST. ANNE.



First Floor Plan.

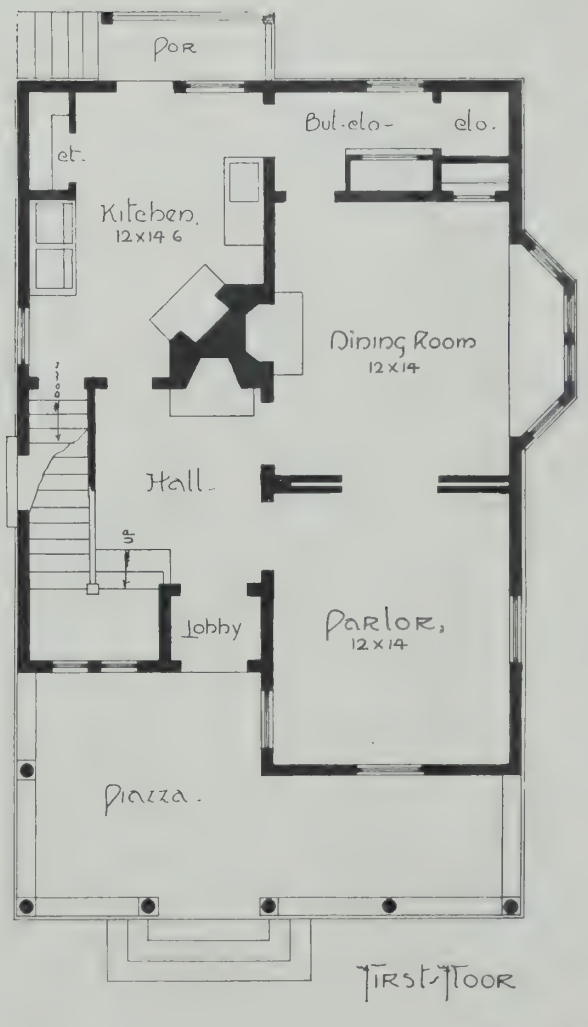


Second Floor Plan.

A COLONIAL RESIDENCE AT LARCHMONT, N. Y.—See page 16.

MR. FRANK A. MOORE, ARCHITECT

Second Floor



First Floor

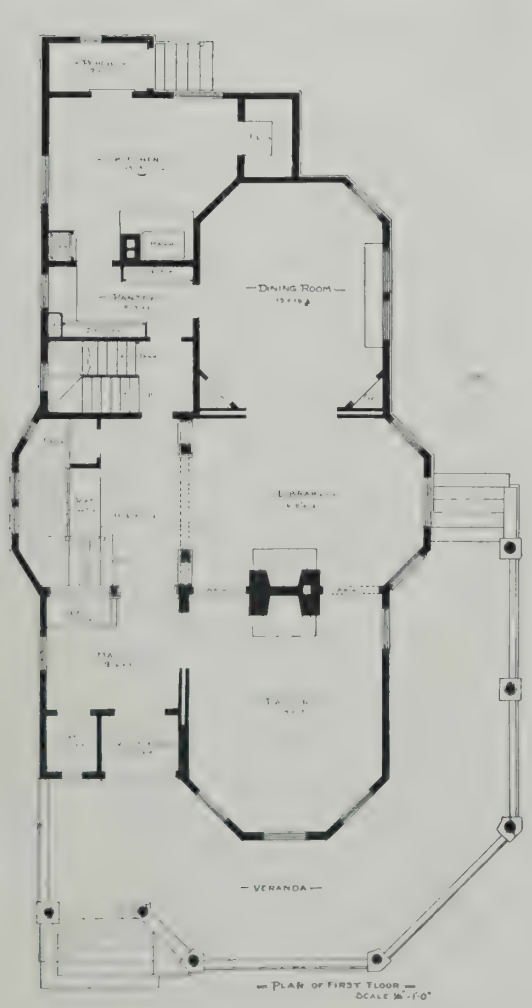
PUBLIC LIBRARY

A MODEL DWELLING AT NEW UTRECHT, BOROUGH OF BROOKLYN, N. Y.—See page 16.

MR. GARDNER ABBOTT, ARCHITECT.

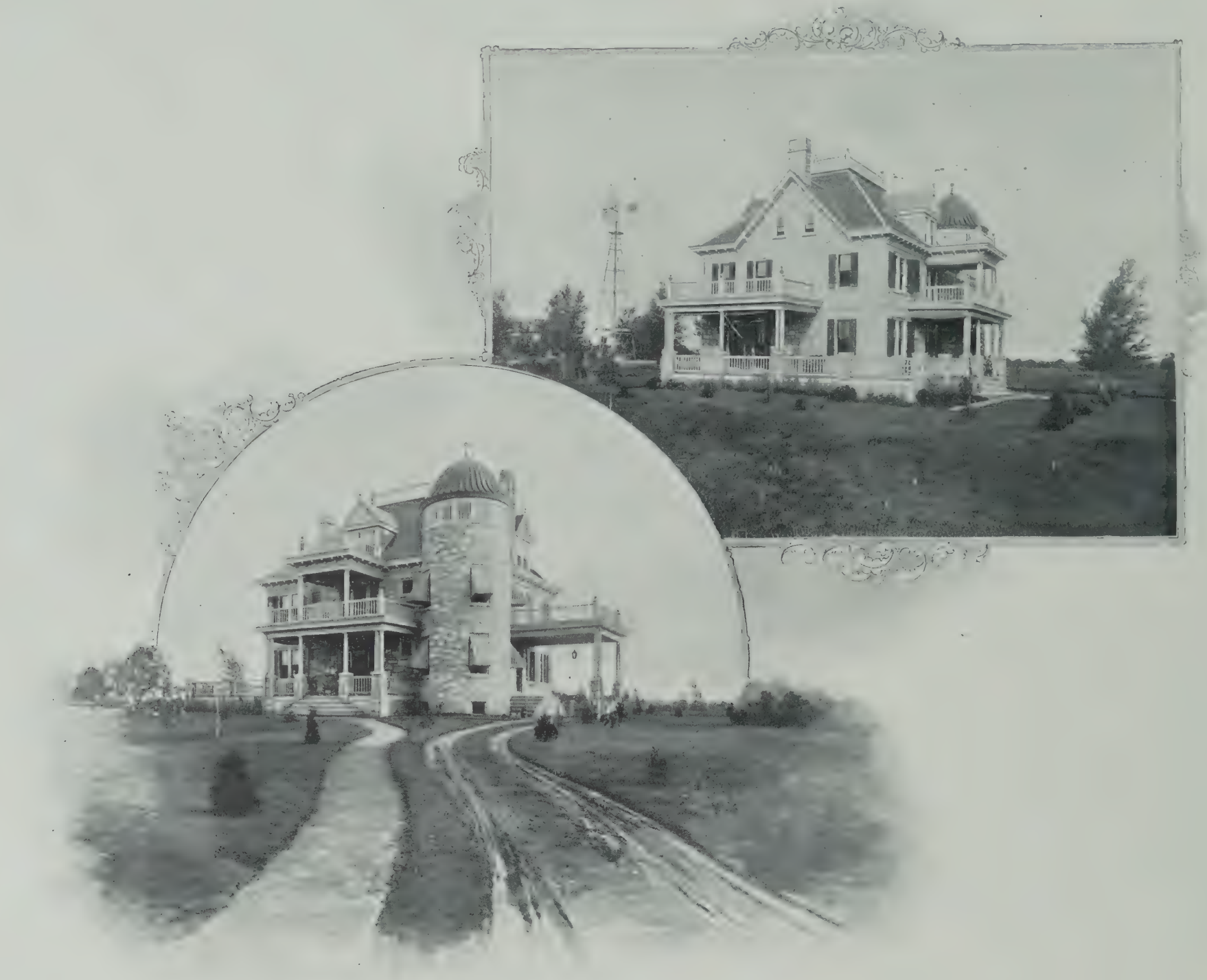
A MODERN RESIDENCE AT MOUNT VERNON, N. Y.—See page 3.

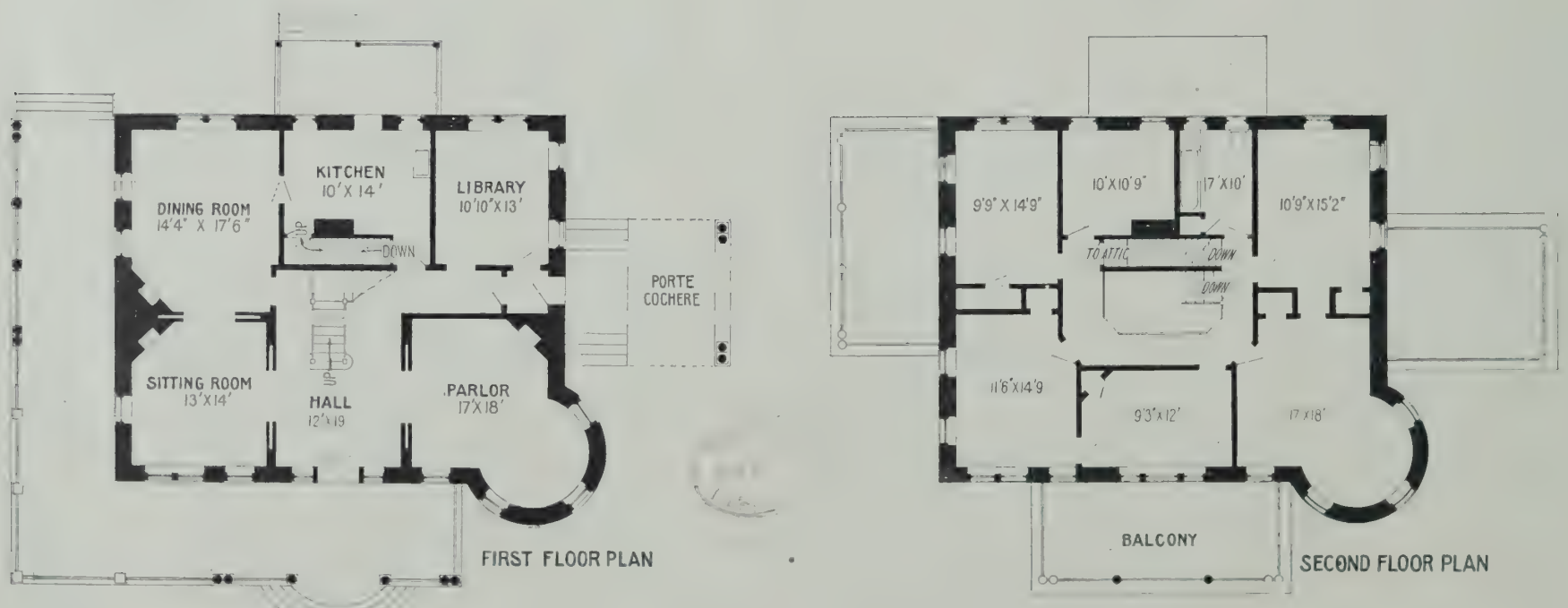
MESSRS. CABLE & LUCAS, ARCHITECTS.



A MODERN RESIDENCE AT MOUNT VERNON, N. Y.—See page 3.

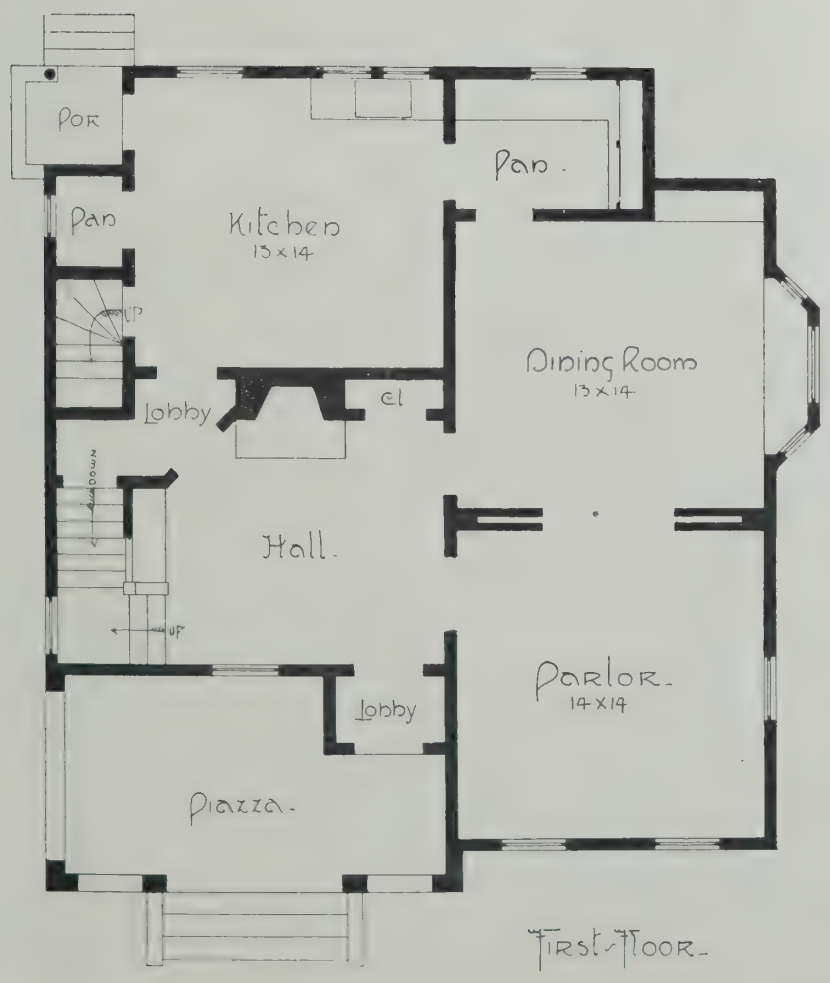
MESSRS. CABLE & LUCAS, ARCHITECTS.

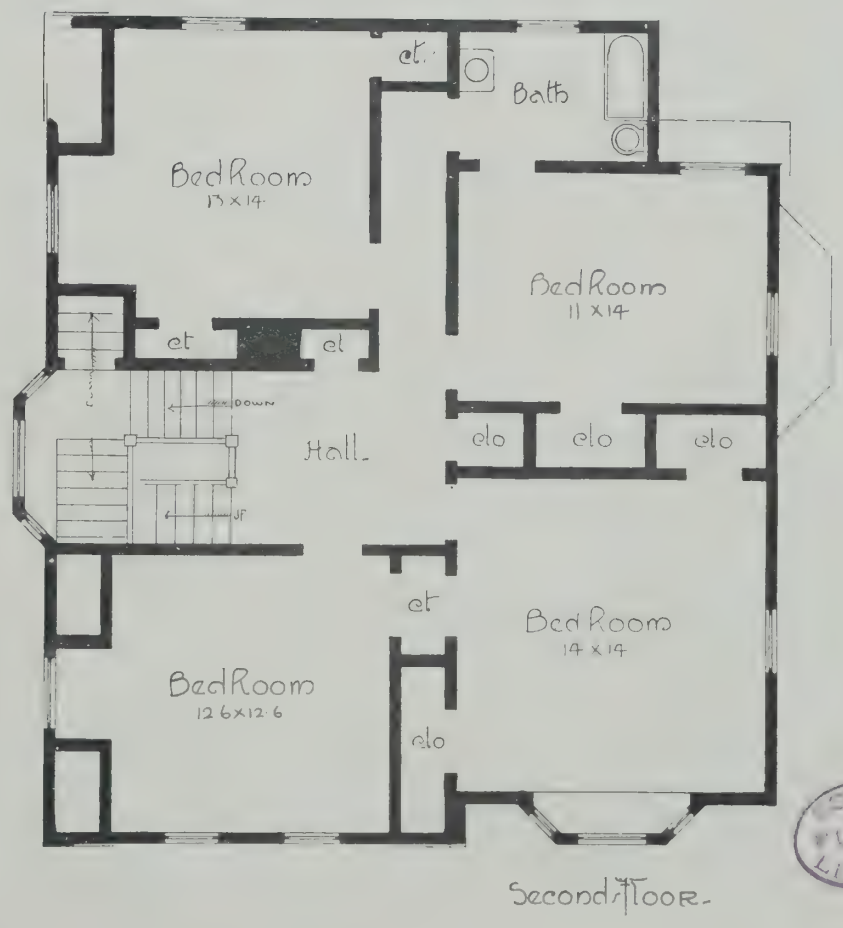




A MODERN RESIDENCE AT LAUREL SPRINGS, N. J.—See page 16.

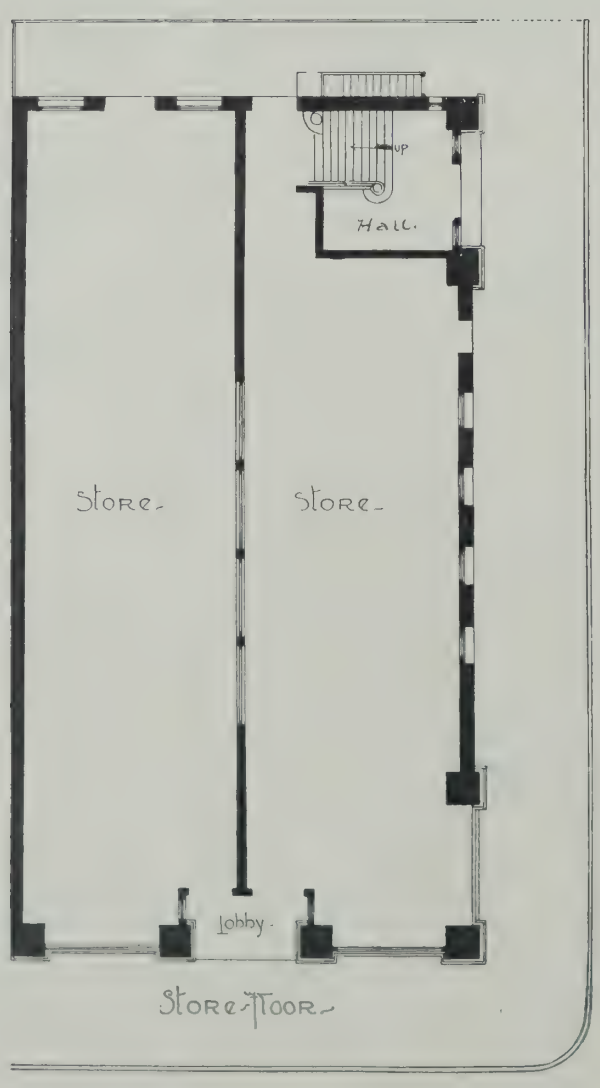
MR. CHARLES H. MORRIS, ARCHITECT.

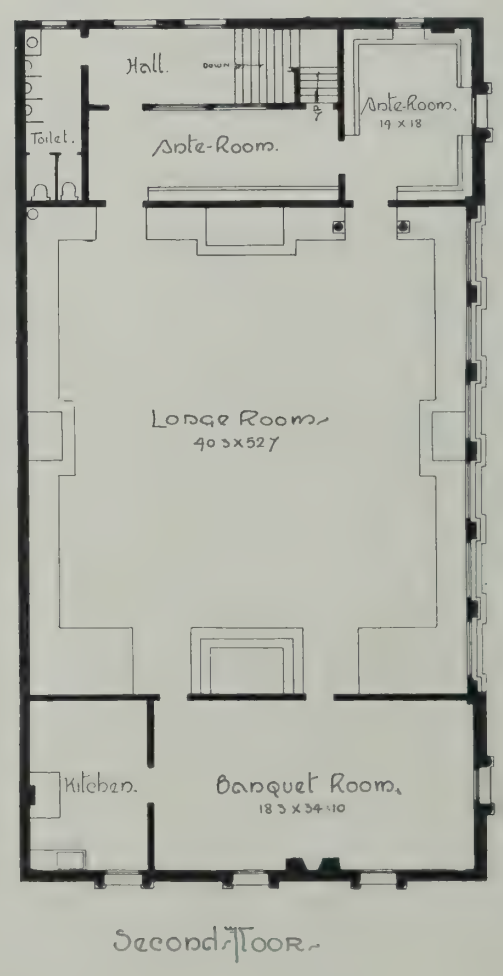




A RESIDENCE AT SPRINGFIELD, MASS.—See page 16.

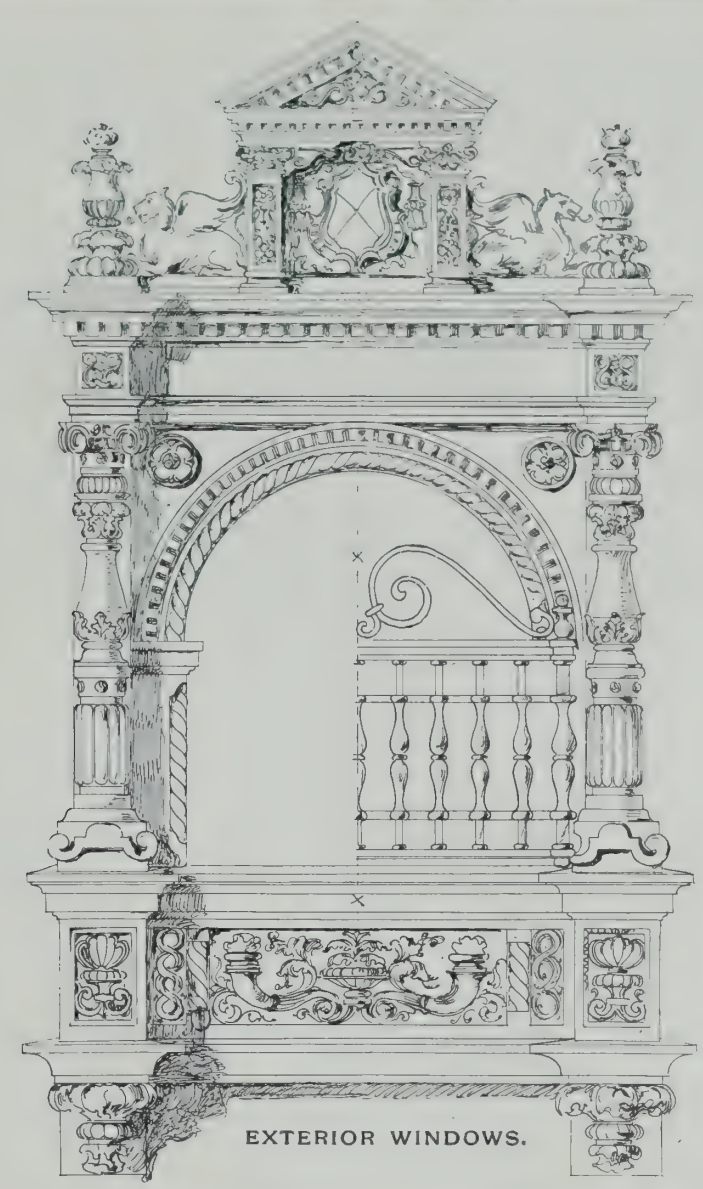
MESSRS. J. D. AND W. H. McKNIGHT, ARCHITECTS.





A FRATERNAL HALL, AT PALO ALTO, CAL.—See page 16.

MESSRS. NEWSOM & MEYER, ARCHITECTS.

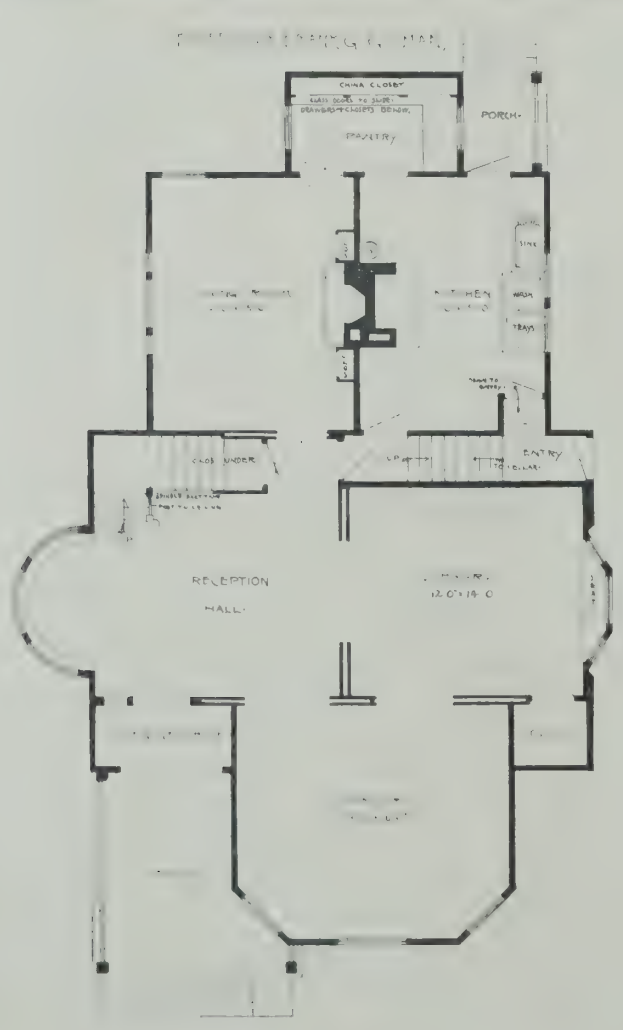


EXTERIOR WINDOWS.

THE LODGE ROOM.

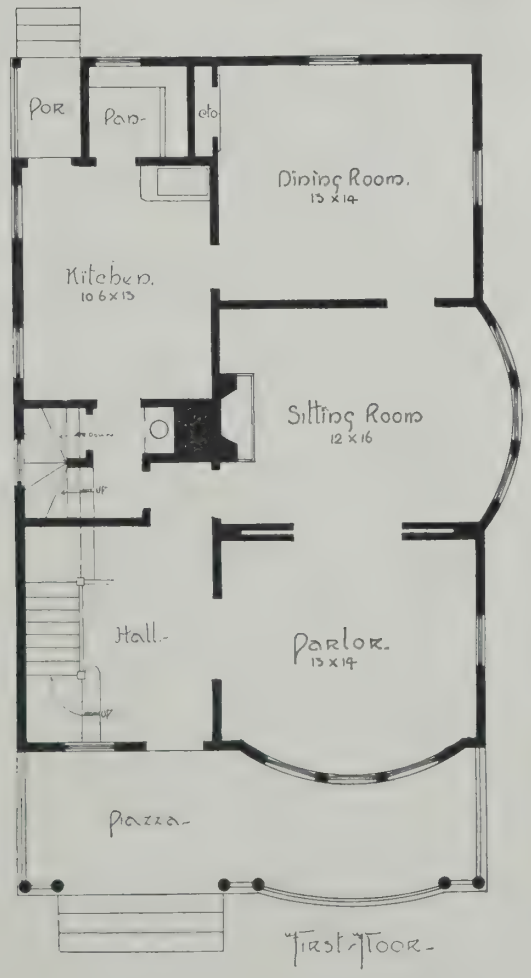
A FRATERNAL HALL, AT PALO ALTO, CAL.—See page 16.

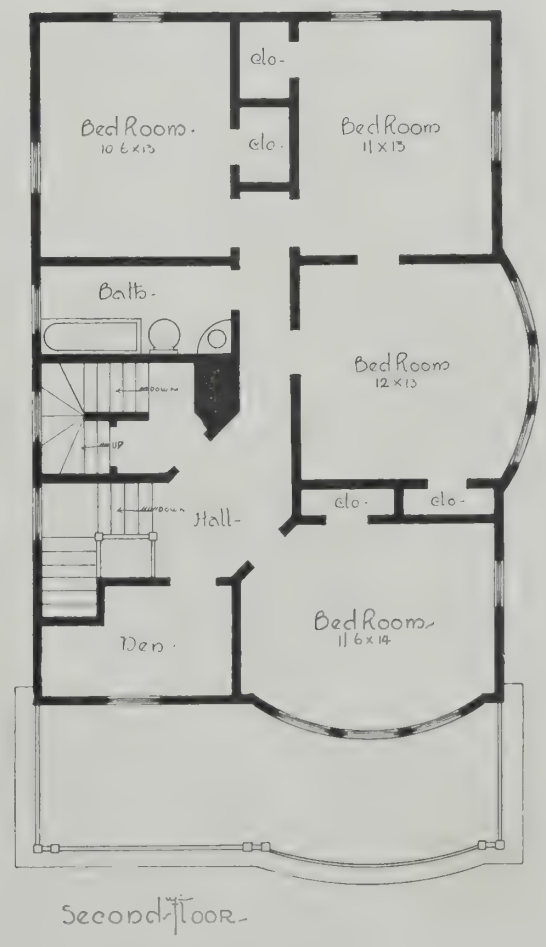
MESSRS. NEWSOM & MEYER, ARCHITECTS.



A RESIDENCE AT FOREST HILL, NEWARK, N. J.—See page 16.

MR. CHARLES P. BALDWIN, ARCHITECT.



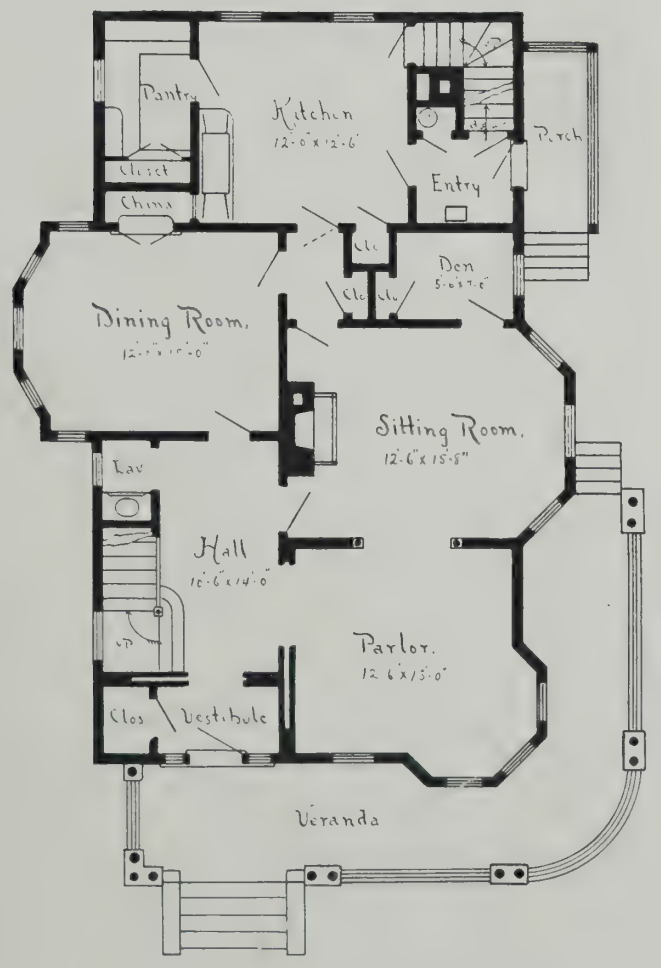


A MODERN RESIDENCE AT BRIDGEPORT, CONN.—See page 3.

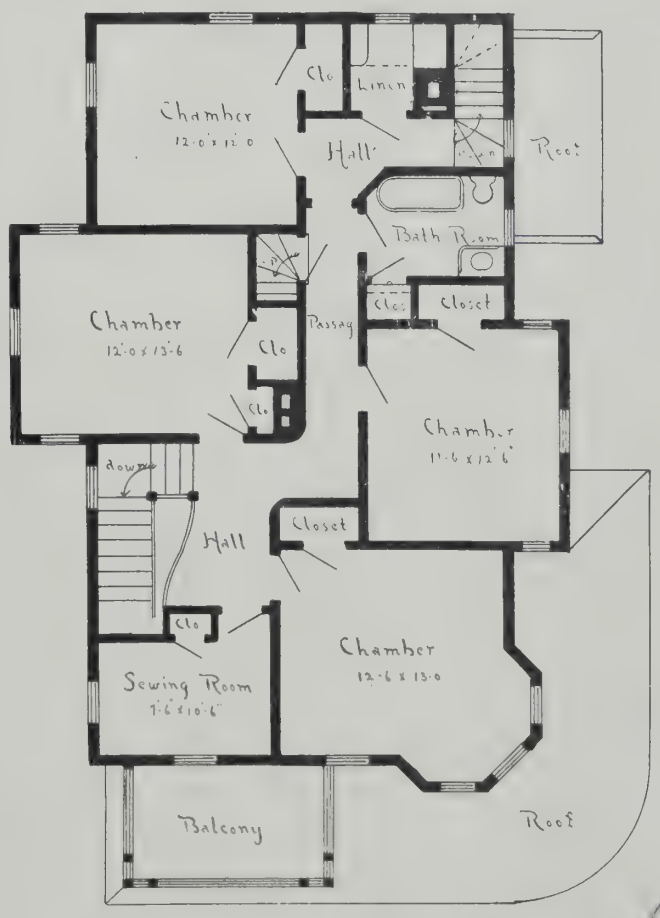
MR. A. H. BEERS, ARCHITECT.

A MODERN RESIDENCE AT SPRINGFIELD, MASS.—See page 16.

MR. G. WOOD TAYLOR, ARCHITECT.



First Floor Plan



Second Floor Plan

A RESIDENCE AT WORCESTER, MASS.—See page 2.

MESSRS. GEORGE AND J. P. KINGSTON, ARCHITECTS.

A MODERN RESIDENCE AT LAUREL SPRINGS, N. J.

THE engravings presented on page 8 in this issue illustrate a modern residence which has been erected for Samuel S. Cord, Esq., at Laurel Springs, N. J. The design is admirable, and it presents many excellent features, including the tower, spacious porches, balconies, porte-cochère, copper dome on tower, and stone chimneys. The building from foundation to roof is constructed of Avondale quarry stone of a gray and white color, laid in broken range work, every stone cut and dressed to fit. The roof is covered with green slate. Dimensions: Front, 43 ft.; side, 36 ft., not including piazzas, which are 10 feet wide. Height of ceilings: Cellar, 7 ft.; first story, 10 ft. 6 in.; second, 9 ft. 6 in.; third, 9 ft. The cellar is cemented, and contains latest improved laundry, two furnaces, and other necessary apartments. The entrance is through a front door, four feet wide, of quartered oak, with beveled plate glass panels. On either side of doorway are windows with leaded glass, which throw a pleasant, subdued light over hall. All the rooms on first floor are trimmed with quartered oak. The hall, broad and spacious, contains an ornamental staircase, rising up from centre of hall, turned out of quartered oak. The parlor is lighted by three windows in tower, and a small, square leaded glass one at front. It contains an open fireplace, with tiled facings and hearth, and a handsomely carved mantel of Colonial style. The sitting-room, opposite parlor, is connected to hall and dining-room by sliding doors, which can be thrown open, making one grand suite. This room contains also an open fireplace, with tiled trimmings and carved Colonial mantel with columns. The dining-room has large windows running down to floor, a fireplace furnished with quartered oak mantel, carved, and of Colonial style, and tiled facings and hearth. The library is separated from the main house, and it has a private entrance from porte-cochère, with a mosaic tiled vestibule. The kitchen is conveniently located, and is trimmed and wainscoted with chestnut, and contains all the best modern fixtures and improvements. The second floor is trimmed with chestnut, and it contains five bedrooms, a sewing-room, and bathroom. The bedrooms are furnished with large, well-fitted up closets. The bathroom has a floor laid with white encaustic tile in octagons, with square blue blocks, and ornamental border. The side walls have white enamel tile, with the Colonial vine and bow knot in gilt for a border. It contains porcelain fixtures and exposed nickelplated plumbing, and also shower-bath, shampoo attachment, and everything complete. The third floor contains the servants' quarters and ample storage. Cost, $15,000, complete. Mr. Chas. H. Morris, architect, Laurel Springs, N. J.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A COLONIAL RESIDENCE AT LARCHMONT, N. Y.

THE engravings presented on page 4 in this issue illustrate a residence of Colonial treatment which has been erected for Mr. Eustice L. Hopkins, at Larchmont, N. Y. The design is admirable in its treatment, both exterior and interior, and it contains many unique features. The underpinning is constructed of granite, laid up in rock-faced ashlar. The superstructure above is covered on the exterior framework with sheathing, paper, and clapboards, and is painted Colonial yellow, with ivory white trimmings. The roof is covered with shingles, and is finished natural. Dimensions: Front, 44 ft.; side, 44 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The vestibule is paneled. The hall is treated in China white, and is finished in an artistic manner with pilasters and columns, and is separated from the staircase hall by an archway. Both halls have paneled wainscotings and wood cornices. The staircase is an ornamental one, with spindle balusters and posts, treated in white, while the rail is of mahogany. A feature of this staircase hall is the toilet, which is conveniently located under the stairs, and also the bicycle-room and entrance, which is a novel and unique feature in itself. The reception-room is treated with china white in an artistic manner, and it has a paneled divan placed in the bay window. The living-room is trimmed with quartered oak. It has a paneled wainscoting, wood cornice, two bay windows with seats, and an open fireplace with facings and hearth of Roman brick, and mantel. Bookcases are also built in at one side of room. The dining-room is an unique apartment; it is circular in form and has a heavy coved ceiling. It is treated in white, with mahogany buffet, doors, and chair rail. There are also two china cabinets built in corner of two ends of the room. The butler's pantry, kitchen, and the scullery departments are trimmed with North Carolina pine, and furnished with the best modern conveniences. The second floor is treated in China white, and it contains four bedrooms, dressing-room and bath, large closets, linen closet, bathroom, and servants' hall and two bedrooms. A feature of unusual novelty is the flag-pole pocket, shown on plan, and which works upon a crank, being properly adjusted, ready to be placed in position or out of sight as may be desired. The bathrooms are treated in China white, and are furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and trunk room. A cemented cellar contains furnace, laundry, and other necessary apartments. Mr. Frank A. Moore, architect, No. 123 East Twenty-third Street, New York city.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT SPRINGFIELD, MASS.

THE engraving shown on page 9 in this issue illustrates a residence which has been erected for Miss E. Maud Ashley, at Armory Hill, Springfield, Mass. The engraving shows a well-proportioned design, with many good features. The underpinning is built of brick, laid up in red mortar. The superstructure is covered with sheathing, paper, and shingles, and then stained a Vandyke brown, while the trimmings are painted cream white. The sash and blinds are painted bottle green. The roof is covered with shingles and stained a moss green. Dimensions: Front. 35 ft.; side, 35 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior is arranged in a most complete manner. The hall is trimmed with oak, and it has a paneled wainscoting and ceiling beams. The fireplace, built of brick, is furnished with a tiled hearth and facings, and a mantel made from special design. The staircase is an ornamental one, and is turned out of oak, with seat at side, and a bay window with latticed lights thrown out at landing. The parlor is trimmed with pine, and treated in white and gold. It connects with dining-room, which is trimmed with oak, and provided with paneled wainscoting, a beamed ceiling, and a nook built in with buffet in a handsome manner. The pantries and kitchen are trimmed and wainscoted with ash, and are furnished complete with all the best modern fixtures. The second floor contains four bedrooms, with large closets, and bathroom, wainscoted and furnished with porcelain fixtures and exposed plumbing. The third floor contains three bedrooms and ample storage room. A cemented cellar contains laundry, furnace, and other necessary apartments. Messrs. J. D. and W. H. McKnight, architects, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN RESIDENCE AT SPRINGFIELD, MASS.

THE engraving shown on page 14 illustrates a modern residence which has been erected for Messrs. J. D. and W. H. McKnight, at Springfield, Mass. The building is designed in an attractive manner, and it has many excellent features. The underpinning is built of red brick, laid up in red mortar. The superstructure is sheathed on the exterior, and then covered with clapboards and painted a rich red color, brilliant in tone, with ivory white trimmings. The roof is covered with shingles, and stained a moss green in harmony with the remainder of the color scheme. Dimensions: Front, 28 ft. 6 in.; side, 51 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior arrangement is excellent, and it is finished off in a handsome manner. The hall is trimmed with cherry, and it contains an ornamental staircase turned out of cherry, with handsome newel posts, balusters, and rail, and it is lighted effectively by delicate tinted glass. The parlor is treated in ivory white, and it has an open fireplace trimmed with tile facings and hearth, and mantel treated in ivory white same as trim. The library is trimmed with cherry, and is separated from the hall by an archway supported upon columns rising up, and finishing with Ionic capitals at archway. The fireplace is trimmed with tiles, and furnished with a carved mantel. The dining-room is trimmed with oak. It is furnished with a paneled wainscoting, ceiling beams, and a buffet of handsome design built in nook. The centre window is a French window, and runs down to floor, opening on to balcony at side. The kitchen and pantries are trimmed and wainscoted with yellow pine, and are fitted up in the best possible manner with all the modern and necessary fixtures. The rear hall and toilet are conveniently arranged and fitted up. The second floor contains four bedrooms, some of which are treated in cherry, while the remainder is treated in white. The bathroom is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary rooms. Mr. G. Wood Taylor, architect, No. 425 Main Street, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODEL DWELLING AT NEW UTRECHT, BOROUGH OF BROOKLYN, N. Y.

WE present on page 5 in this issue a model dwelling, which has been erected for the New York and Long Island Realty Company, at New Utrecht, Borough of Brooklyn, N. Y. The design is of the gambrel roof order, with Colonial detail, and it has many excellent features. The underpinning is built of rock-faced stone. The superstructure above is covered with sheathing, paper, and then clapboards and shingles. The clapboards are painted a dark bottle green, while the shingles are stained a dull shade of moss green, in harmony with the clapboards. The trimmings are painted white. The roof is covered with shingles and finished natural. Dimensions: Front, 28 ft. 6 in.; side, 35 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior is trimmed throughout with cypress, and finished in cherry. The hall contains an ornamental staircase, with turned newel posts, balusters, and rail. The parlor and dining-room are separated by sliding doors, and the latter contains a bay window thrown out at side, and an open fireplace built of brick, and furnished with tiled facings and hearth, and mantel. The butler's pantry is well fitted up with dressers, closets, and cupboard. The kitchen is wainscoted, and is furnished with all the best modern fixtures, including sink, wash trays, pantry, and fireplace for range. The second floor contains a large, open hall, three bedrooms, and bathroom, the latter being wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains one bedroom and ample storage room. A cemented cellar contains furnace and other necessary rooms. Cost, $2,500, complete. Mr. Gardner Abbott, architect, No. 123 East Twenty-third Street, New York city.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT FOREST HILL, NEWARK, N. J.

THE engravings shown on page 12 in this issue illustrate the residence of Prof. Frank G. Gilman, at Highland Avenue, Forest Hill, Newark, N. J. The design shown is of an attractive character, and it combines both pleasing elevations and well arranged plans. The circular bay window at side is a good feature. The underpinning and stonework, where shown, are constructed of field stone, laid up at random. The superstructure, of wood, is covered on the exterior with sheathing, paper, and then clapboards mitred at the angles. The exterior is painted a light gray, with brown trimmings. The roof is covered with shingles and stained a reddish brown. Dimensions: Front, 35 ft. 6 in.; side, 51 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. 6 in. The principal characteristic of the first floor is the planning of reception hall, parlor, and library, so that they can be thrown into practically one room. The reception hall is treated architecturally like a room, the stairway being screened with a portion of spindlework in an artistic manner. This hall is trimmed with cypress, finished natural. The parlor and library, of good dimensions, are trimmed with cypress, while the latter contains a large closet and a bay window thrown out, with paneled seat. The dining-room is trimmed with oak, and it contains an open fireplace trimmed with tiled hearth and facings, and mantel to correspond with trim. The large butler's pantry and kitchen are trimmed and wainscoted with yellow pine, and are furnished with all the best modern fixtures complete. The customary outside cellar entrance is dispensed with by having an entrance at ground level at the side of the building, and utilizing cellar stairs from kitchen. The second floor contains four bedrooms, with large closets and bathroom, the latter being wainscoted and furnished with porcelain fixtures and exposed plumbing, all nickelplated. The third floor contains servants' quarters and ample storage. A cemented cellar contains furnace and other necessary rooms. Mr. Charles P. Baldwin, architect, Prudential Building, Newark, N. J.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A FRATERNAL HALL, AT PALO ALTO, CAL.

A FRATERNAL hall, built in Spanish Renaissance, has recently been erected in the little town of Palo Alto, Cal., the site of the great Leland Stanford Junior University, endowed with $20,000,000. We give exterior and interior views on pages 10 and 11. The hall was designed for social and civic purposes, as well as for the use of the different bodies of the fraternal orders which are always a prominent feature of the society of every community on the Western coast. Palo Alto is the home of many of the professors of the university as well as students. It has participated in the growth of the neighboring scholastic institution, and all its public and private buildings conform to the architectural style of those of the university, which is modified Spanish. The hall was built by subscriptions from the residents, each of whom subscribed according to his means. The construction and selection of a plan were placed in the hands of a competent committee, with the result that the little university town possesses a hall that is the pride of all the citizens. It is built of brick and coated with cement, painted a light cream color. The first floor is devoted to business, and has an elevation of fourteen feet.

The second floor contains the main hall, with kitchen, dining-room, closets, and anterooms, fitted with the usual conveniences. The woodwork and paneling is of Oregon pine. The exterior windows are copied from a famous structure of Old Spain, and are barred with iron gratings of ornamental patterns. The pillars of the first floor are of pressed brick. The cost was about $15,000. Messrs. Newsom & Meyer, of San Francisco, are the architects.

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SUBTERRANEAN LABYRINTHS AND MECHANICAL MARVELS IN THE NATIONAL CAPITOL.

(Concluded from June Number.)

THE HALL OF REPRESENTATIVES.

The Chief Engineer, during the sessions of the House, is almost continually on the floor taking notes of the ventilating appliances, and making observations of the condition and volume of the air supply. Hanging against the Speaker's desk, inclosed in a wooden case, is a very delicate instrument, technically called "Thermostat," which notes the least variation in the temperature of the atmosphere. The attendant on duty in the Engineer's office down in the crypt is kept informed of the condition of the air in the Halls by means of an automatic electrical attachment which is connected with a register or gauge, and which is on view in the Engineer's office. By means of the "anemometer," which is a small piece of delicate mechanism, somewhat resembling an old-fashioned "bull's eye" silver watch, with a very sensitive air-wheel attachment on one side, the shaft of which operates the inclosed mechanism, the volume of air is measured. The air passing against and through the wings of the air-wheel sets the instrument in motion, and registers on its dial the volume of air passing through the air-ducts in a given time. This little instrument keeps the Engineer informed as to the volume of air passing through the House, so that he can increase or diminish the flow of air to suit the condition of either a crowded or empty Hall, always aiming to keep the supply for each individual at from thirty to sixty cubic feet per minute, as the season may require. Notwithstanding all these arrangements to secure perfect sanitary ventilation, complaints are made at times of either the air being bad or the ventilation poor. In such cases the Engineer places on the desk of the complainant a little French aromatic smoking pastille and ignites the same. The smoke and aroma will take the direction of the air-current. To test the volume and current of air, at a given electrical signal, a small piece of frankincense is burned in the air tunnel in the crypt, with an inspector in the roof-room or garret over the Hall of the House noting the length of time for the fumes to pass through the air-vents that are cut in the ceiling. This test shows that under all favorable circumstances it takes about one minute for the fumes to reach and pass through the air-ducts, up through the Hall, and out at the roof-openings.

It is perfectly feasible, with all these appliances, to produce any atmospheric condition required, in spite of climatic changes or physical derangement. If the air is too cold, it may be heated; if it is too dry, it can be moistened. It can be tempered to suit sanitary conditions, and be given volume and current to satisfy every need for healthful respiration. An automatic governor keeps the engines at a uniform speed. The same system is in use to ventilate the Senate Chamber and corridors of the entire building. The architect of the Capitol has also adopted it in the Committee and storage rooms By keeping a current of heated air circulating through these rooms the dampness is eliminated from the walls and ceilings. This air current is kept at a temperature above the dew-point.

WATER AND LIGHT.

The Potomac River supplies the necessary water, which is introduced into the subbasement through a six-inch pipe of the City Water Department. In the crypt plant, near by the boiler and engine, is located a park of pumps which force the water from the receiving main to a series of iron tanks in the room or loft over the Hall of the House. There are four of them, and they resemble immense steam engine boilers. They have a combined capacity of sixteen thousand gallons. A series of hidden pipes conveys the water from the reservoirs down to all parts of the building for the various purposes needed. Mechanical indicators take a record of every stroke of the pistons of the pumps and engines. A gauge in the Engineer's office shows the pressure of the river water supply, and another indicates the height of the water in the roof tanks. When the water-gauge registers thirty pounds pressure, the tanks are full of water. If the water, which is constantly flowing down through the pipes, should not be used or is not needed, then the tanks will fill and necessarily overflow, as the pumps are always at work. For such a contingency there is an escape-pipe leading from the upper rim of the tanks, through which the overflow passes down through the walls to the crypt, where, by means of the pressure of the escaping current, a little whistle is automatically blown. At the time the whistle is sounding the alarm, a damper-regulator, operated by the pressure on the water-gauge, throws up its nickelplated arm and closes the draft from the boiler. By means of these little indicators the condition and workings of the engines, pumps, and tanks are communicated to the Engineer.

Recesses in the walls of the main corridor, and inclosed by iron plate doors, locate the supply of water from the fountain. Here the employés about the building obtain the supply of water necessary for ordinary purposes. The visitor will notice the silver faucets of the drinking water fonts protruding from the marble slabs in the little recesses in the walls at convenient points along the main passageways through the main building. This supply of cool water is furnished by means of a very simple device. In the subbasement, near the room of the aspirating fan, is a box four by five feet, on the bottom of which is placed a battery or series of inch iron pipes similar to a steam register. The box is filled with ice daily. The pipes lead from the main water tanks, and the water, passing down through this nest of pipes buried in ice, becomes cooled, the pressure from the tanks forcing it up to all parts of the building.

The lighting of the Capitol is done on rather primitive principles, but there has been a movement on foot toward the general adoption of electricity for that purpose. The Legislative Chambers are lighted by turning an electrical current on the wires that run through the roof-room, where, over the ornamental glass plates of the ceiling, are located the burners. The burners are bridged by a delicate platinum coiled wire, which conducts the spark over the tip of the burner, and makes the connection with the wire on the opposite burner. The basement is well supplied with the latest improved Westinghouse dynamos, which are being utilized for special lighting purposes. Primary batteries are used to operate the annunciators to various doors throughout the main building.

THE PANTHEON.

After wandering through the long arched tunnel-like subpassageways, and nearing the centre of the building, just under the Rotunda, we come to what is called "The Pantheon." It is what would be designated in ecclesiastical architecture the undercroft. It is a dark recess, or cell, almost hermetically inclosed within these subbasement walls, and was originally designed as the tomb of Washington. But for family reasons another resting-place was determined upon for the remains of "The Father of his Country." Until the last few years, when it was given over for the use of the Congressional Library, it has been used as a storage place for the catafalque, upon which have lain in state the remains of so many illustrious statesmen in the Rotunda above. It was also found a convenient place to store the plaster models of busts and statues that had been offered by sculptors from time to time, in competitive exhibition before the Joint Committee of the Library. Many of the disappointed artists abandoned their works to the care of the Chief Architect of the Capitol, who is the official custodian of these efforts of genius and art. From year to year the number grew, and as they numerically augmented they were consigned to niches and shelves in this "morgue," until the undercroft presented the appearance of catacombs, filled with the plaster representatives of our Illustrious American Dead. Hence the name of "Pantheon" to this central crypt.

Hall of Records Interior.

AT a recent meeting of the Board of Estimate and Apportionment, Comptroller Coler presented a report on the plans and specifications of Architect John R. Thomas for the interior finish and decorations of the new Hall of Records. The contract for the building alone was let at $1,900,000, though the finish of the interior, according to the estimate of the architect, will cost $2,500,000.

Vestibules, rotunda, and corridors will be finished in marble and floors in mosaic. Window-frames will be covered with copper, and ceilings finished in marble and mosaic. Artists to execute the work will be selected and controlled by the architect. Two sculptured groups of twenty-four figures each will adorn the two main entrances, the cost of the groups being estimated at $85,000. The figures will be cut from Carrara marble. Each floor will be finished in different kinds of marble. From the first to the fifth mezzanine floors, except the rooms, Monterrenti Siena marble will be used; in the rooms of the first floor, Connemara green marble; on the second, third, and fourth floors, Pavonazza marble; in the north court, Lake Champlain marble; in the south court, Connemara marble; and in all the other portions of the building marble from different countries, with Jasper marble to give effect.

Engineer McLean of the Finance Department reported in favor of the architect's plans. Members of the board were impressed with the splendor of the work, and President Guggenheimer asked to have them laid over for a week. They were laid over. Comptroller Coler said that the plans would be referred to the Municipal Art Commission for approval.

Stoves and Methods of Heating in Korea.

IN reply to numerous inquiries from manufacturers of stoves in the United States as to the prospects of extending their business to Korea, I wish, says Mr. Horace N. Allen, Consul-General, to make answer in this general manner:

"Stoves are not used to any extent by the native Koreans. The Korean method of heating is most excellently adapted to their resources and conditions. In building their houses they lay down a system of flues where the floor is to be. These flues begin at a fireplace, which is usually placed in an outer shed or connecting closed alleyway. From this fireplace the flues extend in a more or less curved direction, like the ribs of a round fan, to a trench at the rear of the room, which, in turn, opens into a chimney, which is usually placed some distance from the house. Flat flagstones are then placed carefully over these flues, and the whole is cemented over, and finally covered with the thick oil paper for which the country is noted. This paper keeps smoke from entering the room, and a little straw or brushwood, used in the fireplace for cooking the rice, serves to heat the stone floor, and gives an agreeable warmth which lasts until the time of the next meal. Two heatings daily serve to give the people a nice warm floor, upon which they sit in the daytime and sleep at night. By leaving their shoes at the door the inmates preserve the paper floor, which, from constant polishing, takes on a rich brown color.

Among the poor these rooms are cubes of eight feet, but in more pretentious houses there will be a suite of four of these rooms, opening into each other by sliding doors, and capable of being thrown into one large room. A suite of these rooms on either side opens upon a large room with a board floor, which is 18 x 18 feet, or larger, and unheated. This is used for summer, and at all times as an outer hall and reception-room. These houses are built around an open court, upon which at the back opens this large reception-room. A better system of heating, or one more economical, would be difficult to devise for a country where the winters are so severe as in Korea, and where fuel is so scarce and expensive.

Korea has little timber, but excellent deposits of bituminous and anthracite coal, especially the latter. So far all requests for concessions to mine these coal deposits have been positively refused by the Korean government. Natives dig out the surface coal in the crudest and most expensive manner, allowing the debris and water from the heavy rains to fill up the shaft or hole, and damage the coal to be got out the following year. The result is that the coal finally offered for sale is so rotten from exposure to wet and cold that, after it has been frequently handled and packed on pony back, it arrives in Seoul mostly in the condition of fine dust, which has to be mixed with wet red clay and made into balls by hand. These balls, when dry, are used by the foreigners in their stoves. This poor stuff is exceedingly expensive, costing, this year, 18 yen ($9) per ton, from which must be taken the included weight of some fourteen or sixteen heavy straw bags in which the coal arrives.

The few hundred foreigners in Korea (Americans and Europeans) use stoves, as the paper floors do not answer for foreign use, owing to the fact that our rooms are too large and our shoes and furniture soon ruin the floors. Stoves from Germany at one time were quite in favor, but the stove most commonly used now is one made at Dowagiac, Mich. Even a few Koreans have begun to employ them.

Owing to the high price of coal, numbers of kerosene stoves are now being used, and these seem to appeal to the Koreans, as they are neat and handy, and furnish light as well as heat.

There can never, however, be a large trade in heating stoves in Korea so long as the people adhere to their present style of houses."

Treatment of Lime.

LIME ought to be, to the painter, a universal material, and yet many do not know how to handle it, and to use it in the proper place, says Ad. Körbler, in our Vienna contemporary, the Dekorateur. Lime is especially useful for façades, churches, gateways, open halls, and verandas, and particularly on damp walls. In all these places size paint would not be suitable, as the size would quickly putrefy, owing to the influence of the changes of temperature and dampness, thus losing its binding power, while the permanency of the lime is enhanced by the action of the oxygen in the air. Especial durability is obtained by roughening old walls with coarse pumice stone before painting, subsequently washing off the walls or at least removing the dust. Peeling of a lime-coating is due to too thick an application or to putting on a fresh coat before the first is dry.

In order to enhance the durability of the lime various binders may be added to it, as follows: If more earth colors are to be added to the lime than it is capable of binding, caseine size should be employed. The caseine is rubbed up, together with the milk-water, with unslaked lime and thinned with milk. In Switzerland lime slaked with caseine water is used, thinned with milk, and the durability is excellent. Frequently kitchen salt or rock salt

is also added, but this is only advisable for white work, as the salt sometimes effloresces, and the colored coating shows white spots after a few weeks.

Varnish and linseed oil also contribute largely to increase the permanency of the lime, but it is best to add these binding agents during the slaking.

Blood is likewise a good binding material. It must be allowed to stand a few days, after hot water has been poured on it. Before use it has to be stirred up well and sifted. Besides, it is necessary to add, on account of the foul odor, 1 kilo. of boracic acid to every 100 kilos. of lime for disinfecting purposes.

Green vitriol imparts to lime a yellow color similar to ochre; copper sulphate in lime gives a handsome blue-green; green vitriol, copper sulphate, and lime give a nice sap-green; and to obtain a fine blue, take a sulphuric solution of cobalt. Such coatings adhere excellently to damp walls, as the substances admixed are much better than earth colors. At the same time they are much cheaper, for 1 kilo. of vitriol is sufficient for a room of considerable size.

All these chemical coloring substances are dissolved, if to be used at once, in hot water, but the solution can also be made with cold water if one waits a few hours. It still deserves mention that these vitriols are not injurious to the skin, the floor or the brushes, that they are not caustic, and do not burn.

For smoky café ceilings it is well to force the thick soft soap together with thick lime, to dilute with water, and to spread out rather compact. But green vitriol is also a good medium for such ceilings. Coat the ceiling previously with lime and green vitriol, let this dry thoroughly, and only then coat with strong soap. It will be found that green vitriol will appear olive green in the receptacle and draws together into a thick paste; this should not cause one any misgivings; it can, after all, be flowed on like thin paint, and turns a handsome ochre yellow.

By some experiments with the above chemicals in the employment by the quantity, the necessary experience in mixing and tinting will soon be acquired.

What Railroads Might Do.

It has long been a subject of wonder to me, says a correspondent of the New York Times, why the railroad stations of the country have not been more generally improved with trees and shrubs in a really intelligent and comprehensive manner, for several excellent illustrations exist in different parts of the country where "he who runs may read." How much can be accomplished in the permanent plant decoration of these stopping places, where the weary or bored traveler must always feel grateful for the presence of flowers and trees!

The Boston and Albany Road, for instance, has, for a number of years, been steadily planting its station grounds with all kinds of trees, shrubs, vines and flowering perennials, until at the present time there is hardly a stopping place on the line, except on some branch in the mountain districts, where one does not see vineclad banks and shrubs and flowers blooming throughout six months of the year, and bearing beautiful foliage in many cases throughout the entire twelve months, and what makes these station grounds still more beautiful is the fact, which is at once evident, that a parklike effect of open stretches of turf and artistically disposed groups of trees and shrubs meet one at every stoppage of the train.

There is, it should be said at the outset, a more or less well-developed scheme of improving the grounds of stations with plants on almost every railroad in the country, showing how widespread is the recognition of the value of such adornment. But the contention I desire to make is that larger views of the possibilities of floral and arboreal beauty throughout the year should prevail among those clothed with the responsibility of maintaining railroad stations, and that, instead of limiting themselves to the brilliant effects of coleuses and geraniums for two or three months of the summer, they should see that the whole range of trees, shrubs, vines, perennials, and budding plants is included in their scheme for adorning station grounds. It should also be remembered that the limitations of station grounds are in no sense greater, though the grounds be ever so small, than the dooryard of a village lot or a small section of a park, and no one surely hesitates to set any tree or shrub or vine or flowering plant on his lawn, however small, and the value of carefully prepared designs, it is evident, are as necessary to the miniature lawns as to the park or country estate, if the best results are to be obtained.

So far we have been considering the possibilities of improving station grounds, which are only partially realized, as a general rule, and the value of carefully prepared designs for such small places as railroad stations usually are, but the question of expense must always sooner or later intervene, and in regard to that I can only say that I know, from positive knowledge, that a line of the best trees, shrubs and vines, and perennial flowering plants can be secured at as low a rate as the kinds of bedding plants that are used so widely in the adornment of railroad stations at the present time.

I have often been at a loss, when looking at the grounds of different stations, to account for this almost exclusive use of bedding plants, cannas, and geraniums. Such plants are certainly no cheaper in the first place, although the idea may have gained credence that they are, and they last only two or three months, whereas we have seen that it is perfectly possible to continue bloom throughout six months and foliage throughout the entire year. I know of a great estate, perhaps the greatest in the country, where nurseries for trees, shrubs, vines, and perennials were established at the outset, and their production scarcely limited to three and a half cents per plant.

It looks to me as if many of the railroads had not given sufficient attention to this subject to induce them to lay out money for the purpose in an intelligent way, for the possibilities for beauty growing out of such improvements are almost infinite, and far greater than the wooden or stone structure of the station building, for the design of which railroad authorities are willing to employ the highest talent and expend large sums of money. Indeed, the maintenance of station grounds need be no more expensive than that of the station itself, provided the limit of yearly expenditure for bedding plants be properly restricted, and the grounds occupied in large part with open spaces of turf and suitable shrubs and vines that will cost no more to set out in good soil in the beginning, and will last with little care for a lifetime.

There is no doubt that abroad the subject of planting railroad stations is better understood, as any one who has visited the Isle of Wight will readily remember. The secret, I am sure, of success, in this as in many other undertakings, is the preparation of an initial plan that is both intelligently conceived and studiously worked out in all its minor details.

Tree Planting in the Streets of Washington.

BY WILLIAM P. RICHARDS, SURVEYOR OF THE DISTRICT OF COLUMBIA.

The selection, planting, and care of all trees in the streets of Washington are under the direction of the District authorities. Individual preferences or private enterprises are not allowed to regulate this improvement, as is generally done in other cities. Moreover, the city has its own nursery, where seeds planted from its own trees grow and supply all the needed varieties.

In 1871, during the era of great municipal improvements, Gov. A. R. Shepherd appointed a commission to regulate this important matter, and their efforts have brought about the beauty and uniformity of shade existing in Washington to-day. This commission acted in an advisory capacity and served without pay, the first one appointed being unchanged for twenty-five years. Its members were Mr. William R. Smith, Superintendent of the Botanical Gardens, Mr. William Saunders, Superintendent of Agricultural Grounds, and Mr. John Saul, a local nurseryman. During the last thirteen years Mr. Trueman Lanham has acted as chief executive officer of the commission, or superintendent of parking.

Under the guidance of these men tree planting has never been at an experimental stage, but an undertaking so great has, of course, had its lessons of experience. The qualities of a good curbstone tree were set forth in the annual report of the commission in 1872, as follows:

"First. A somewhat compact stateliness and symmetry of growth, as distinguished from a low spreading or pendent form, so that the stem may reach a sufficient height to allow the free circulation of air below the branches.

Second. An ample supply of expansive foliage, of bright early spring verdure, and rich in the variety of colors and tints assumed during autumn.

Third. Healthiness, so far as being exempt from constitutional diseases, as well as by maladies frequently engendered by peculiarities of soil and atmosphere impurities.

Fourth. Cleanliness, characterized by a persistency of foliage during the summer, freedom from fading flowers, and exemption from the attacks of noxious insects.

Fifth. It should be easily transplanted, of moderately vigorous growth, and not inclined to throw up shoots from the roots or lower portions of the stem. A tree of extremely rapid growth is generally short-lived.

Sixth. The branches should be elastic rather than brittle, that they may withstand heavy storms; and lastly, there should be no offensive odors from foliage or flowers."

Of course, no tree planted amid the artificial conditions found in a city will fill such rigid requirements. This report of 1872 recommended as best the silver maple (*acer dasycarpum*), the American linden (*tilia Americana*), and European sycamore maple (*acer pseudo-platanus*). The American elm (*ulmus Americana*) was thought to fill all the requirements when not subject to the attacks of insects. The tulip tree (*liriodendron tulipifera*), sugar maple (*acer saccharinum*), sweet gum (*liquidamber styraciflua*), and the red maple (*acer rubrum*) were named as the most beautiful of trees, their only drawback being that of not growing freely after transplanting. The Norway maple (*acer platanoides*), the negundo (*acer negundo*), and the American ash (*fraxinus Americana*) were recommended for certain places. For wide avenues the buttonwoods (*platanus occidentalis* and *platanus orientalis*) were considered rapid-growing and effective trees.

Of late years some varieties have been planted that are not mentioned in the above, and others, once common, have been pronounced as poor street trees.

Washington was a city of young trees during the seventies, and in the spring of 1873 more than six thousand trees were planted, consisting of silver maples, Norway maples, American elms, American and European lindens, sugar maples, tulip trees, American white ash, scarlet maples, various poplars, and ash-leaved maples.

From 1880 to 1888 the caterpillars were extremely numerous in the city, and opportunity was had for observing which trees were mostly a prey to them. It was found that the white poplar and the negundo or ash-leaved maple were the first to be attacked, and next the lindens, elms, and sycamores (or Western planes), and white ash. Those mostly exempt were the Carolina poplars, the sugar, silver, and Norway maples, the tulip tree, and honey locusts.

A careful count was made of the trees in 1887, and by comparing this with the number since planted and those removed there is found to be more than 78,000 trees, which if placed thirty feet apart would line both sides of a boulevard between Washington and New York. These consist of more than thirty varieties, but seven-eighths of the number may be placed in less than twelve varieties. The number, location, and peculiarities of the principal trees may best be described separately.

The silver maple (*acer dasycarpum*) numbers about 25,000, or nearly four times any other variety. It is almost a perfect street tree, as it stands transplanting well, is a quite rapid grower, and has beautiful foliage, which is never too heavy to allow free circulation of air. It loves moisture, but nevertheless stands seasons of drought better than many others. It cannot attain at the curbstone the magnificent proportions that it has in the park or field, and must be trimmed at times very severely. It is seldom attacked by the caterpillar, but some years ago a scale appeared on the trees that caused serious thoughts of their removal. This has since disappeared, and the trees are in a healthy condition. It taught the lesson, however, that it is well not to have most trees of one variety. The most recent plantings of the silver maple may be seen on S street, and good examples of severe trimming on Third street N. W., and on T street N. W., from Third to Fifth street.

The Norway maple (*acer platanoides*) numbers about 5,000 trees, and it is unfortunate that more of them were not planted in past years. They require considerable care in transplanting, and are a little too thick in foliage. They are handsome in leaves and form, and are of strong fibre, so that they withstand storms well. Insects seldom trouble them. Two splendid rows of them may be seen on Eighth street N. W., above G street; on Sixteenth street N. W., above H street, and on Thirteenth street N. W., above K street.

The American elm (*ulmus Americana*) numbers about 5,000 trees, planted on various avenues. It is a tree of spreading form, so that, on roadways fifty feet wide, its limbs arch the entire space. From this it is liable to be split by storms. It presents a magnificent appearance at certain times of the year, but the elm-leaf beetle has preyed so constantly on this tree that it is either doomed to disappear as a street tree or else be limited to a small number. New Jersey, New York, New Hampshire and Rhode Island avenues are planted with this tree.

The buttonwood, sycamore, or plane tree (*platanus orientalis* and *occidentalis*) number 5,000 trees. It is a tree of large growth, and must be closely trimmed as a street tree. The Western plane is not an altogether handsome tree, its shedding of bark giving its trunk an ugly appearance, which is objected to by many. As a shade-producer it has no fault. The Eastern plane is its superior in many respects, and it seems unfortunate that its merits were not recognized sooner. Its size and nature make it better fitted for avenues than the narrower streets. Its foliage is splendid in appearance and of proper thickness. It is free of insects. If the elms were replaced, in part, at least, by this tree, much would be added in way of ornament to the city. Good examples of the Western planes may be found on Eleventh street N. W. and Tenth street N. E. The Eastern plane is best seen on Indiana avenue and at the Peace Monument. A magnificent specimen stands in the centre of Lincoln Square, on East Capitol street.

The American linden (*tilia Americana*) numbers 5,000. Most of them are on Massachusetts avenue, which has four rows, nearly four miles in length. In early summer they are at their best, when their flowers fill the street with their fragrance. They need ample space and are apt to suffer much from the drought. They seem to have been planted too close in this city, and have grown very little in late years.

The tulip tree (*liriodendron tulipifera* numbers nearly 2,000. It can hardly be considered a good curbstone tree, as it requires good conditions for its development. It is

fine in appearance, and does well on wide parkings, as on Sixteenth street, which it occupies jointly with Norway maples, the latter along the curb.

The Carolina poplar (*populus monilifera*) numbers about 6,000, and was probably planted on account of its rapid growth. It is a good curbstone tree in many respects, is assertive, free of insects, and is of good foliage. Its bad qualities are, brittle limbs, which are always broken by storms, and a persistency of root-growth that is fatal to sidewalks. Many considerations have doomed them, and they are being replaced with more desirable trees.

The aspen poplar (*populus alba*) and the ash-leaved maple (*acer negundo*), numbering about 2,000, although of good foliage, have been condemned as street trees on account of their liability to attacks of insects.

The ginkgo, or maidenhair tree, although few in number here, has been found to be a good curbstone tree. The pin oak, planted in the parking on East Pennsylvania avenue, has shown itself an ideal tree for an avenue or widely parked street.

The catalpa, along the same avenue, will be removed in the near future. Horse-chestnut trees have been grown with some little success on Thirteenth street N. W., but cannot be called a good street tree.

The sugar maple, although a queen among trees, needs too good care for an ideal street tree. No success has been had in this city with it, although it may be said that attempts have not been persistent. A fine specimen stands in the parking northwest of Thomas Circle.

The red oak, planted on Twelfth street, where surrounded by good conditions, has been a great success.

If required to arrange a list of the trees in this city in the order of their merit and in the light of what has been here shown, I should place the silver maple, Norway maple, and Eastern plane side by side in the first rank, then the ginkgo and Western plane, and last those that require extra care and are well fitted for wide parkings, the American linden, the oak, and the sugar maple.

The planting and care of trees in Washington grow from year to year, and the future will probably demand more skill and judgment than in years past. About $20,000 is spent annually, most of it in the care of old trees. From one to three thousand young trees are planted during the spring and fall of each year. The nursery has several thousand trees of the best varieties ready for planting. After two or three years as seedlings, and four or five years in the nursery rows, they are taken up with no dirt to their roots, and placed on the street in holes from which four or five cart-loads of the original soil have been removed. They are then filled about with suitable earth, and a box placed around for protection. These boxes are seven feet in height, sixteen inches square at the bottom, and ten inches at the top, built of strips 1 x 3 inches. They are held by four stakes, driven into the ground on each side in a slanting direction and nailed to the box. Leather straps are nailed to the top of the box and passed around the tree to prevent any injury to the bark by rubbing in windy weather. These boxes are not an ornament to the street, but are an absolute necessity for the protection of young trees. After the tree has gained sufficient strength, the box is removed, and a wire netting six feet long is fastened around the tree. It costs about thirty-five cents per tree, and some forty thousand trees are protected in this way.

The proper distance to space trees depends on the locality and variety. Too close planting was done during the first year of the commission, the distance along curb being from twenty to twenty-five feet. From thirty to forty-five feet is now considered a better limit.

The trimming of trees is a bone of contention among authorities as to time, manner, and extent. It is certain, however, that some city trees must be trimmed, and trimmed severely, if they are expected to last long.

This outline is presented as a study of the history of this enterprise, and some personal observations of late years. The experience of twenty-five years has not resulted in a unanimity of opinion in the commission itself, as evidenced by a report signed by the three, one of whom had this reservation, "Approved as to facts, but not as to opinions." I, therefore, beg to offer these facts and opinions, leaving to others the privilege of making their own selection.—Municipal Engineering.

The Kenney "Flushometer."

THAT the advantages of the Kenney "flushometer" are fast being generally understood, is evidenced in the steadily broadening adoption of the device where the flushing of water-closets is desired in the most efficient and sanitary manner.

In the new passenger steamer "Pennsylvania," for example, are embodied improvements in plumbing and ventilating appliances that will make her the peer of any ship afloat, from a sanitary standpoint. The entire system of plumbing is the best ever put into a vessel on the great lakes, Kenney "flushometers" being used throughout.

The Kenney Company have a permanent exhibition at their principal office, 72–74 Trinity Place, New York city, showing the various applications of the "flushometer," and will send illustrated catalogues to any of our readers upon application.

THE IMPROVED "COLUMBIA" GRATE.

THE Alcott, Ross & Scully Company, of 2908 North Broad Street, Philadelphia, Pa., are manufacturers of an ingenious gas-grate which possesses merits not found in similar devices. The principles involved in the construction of the grate consist in separating the asbestos fireback ordinarily used, from the back wall of the case, so as to form an air-flue, in providing an air passage in front of the burner for bringing a current of air directly into contact with the flame, and in providing a draft-plate in front of the upper part of the fireback, so as to form a flue into which are discharged the vapors ascending directly from the flame and the air conveyed through the flue behind the fireback.

The manufacturers claim that these gas-grates are economical, for, with fifteen feet of gas per hour, the average room can be heated; that they are excellent ventilators; that they will never burn out; that they burn without odor of gas; that the supply of gas can be controlled; and that the floors are always warm, owing to the perfect downward radiation of heat.

COLUMBIA GAS GRATE.

Domestic Electrical Supplies.

A TASTEFULLY printed and illustrated catalogue has been sent to us by the Electric Gas Lighting Company, manufacturers of domestic electrical supplies, of 195 Devonshire St., Boston, Mass. The catalogue will, no doubt, be of interest to architects and builders. Copies will be sent to any address on application.

A NEW GAS-GENERATING MACHINE.

IN the ordinary method of generating hydrocarbon illuminating gas, a large quantity of naphtha is exposed to the evaporating action of air and is absorbed. The degree of absorption depends upon the amount of naphtha thus exposed, upon the intensity of the heat applied, and upon the quality of the naphtha. This method has its defects, chief among which may be mentioned the lack of any means for producing an absolutely uniform quality of gas, as at times the air is supersaturated and carries an excess of hydrocarbon vapor, which condenses in the pipes, and at other times the air is but partially charged, the amount of saturation varying between these points. The most volatile portion of the naphtha is evaporated, and the portion of lesser degree of volatility often remains in the apparatus, necessitating removal as a waste. The difficulties which have been encountered in filling this want of an absolutely uniform quality of gas from naphtha without waste or condensation seem to have been overcome in the gas apparatus illustrated herewith, and made by the C. M. Kemp Manufacturing Company, of Baltimore, Md.

The apparatus consists essentially of a naphtha-tank, *E*, an air-supply regulator, *A*, a meter-wheel, *D*, and a converter, *G*.

The regulator, *A*, is provided with a gasometer-bell, the rising and falling of which operate the blow-off valve, *B*, of a pipe communicating with a blower serving the purpose of pumping air into the regulator, *A*. The air thus applied to the regulator, *A*, passes through the valved pipe, *C*, into the meter, *D*, by which it is automatically measured into volumes proportionate to the amount of naphtha vapor with which it is to be mixed. As the air is being measured, the meter-wheel shaft is rotated by the passing current of air, the power thus obtained being made to operate a mechanism on the front of the meter-wheel, whereby the requisite quantity of naphtha is pumped from a well-pipe connected with the tank, *E*, and provided with a float cut-off, *F*. By reason of this arrangement the quantity of naphtha fed depends upon the quantity of air passing through the meter-wheel, *D*. The air which has been measured by the meter-wheel and the naphtha are respectively conducted to the converter by the pipes, *J* and *H*.

Within the converter, *G*, a steam cylinder is mounted, to which steam is supplied by the pipe, *L*. The air conveyed by the pipe, *J*, and the naphtha fed by the pipe, *H*, and volatilized by the steam heat, are intimately mingled in the converter; and the inflammable mixture thus produced is distributed to the various burners in the building by the service pipe, *K*.

One chief point of merit of this apparatus resides in the automaticity of its operation. If the demand for gas be great, the gasometer-bell of the regulator, *A*, falls, thereby closing the blow-out valve, *B*, and causing a larger quantity of air to pass to the meter-wheel, *D*. If there be but few burners in use, the gasometer-bell of the regulator will rise, thus opening the blow-off valve, *B*, and permitting the surplus air to escape. When the various burners are shut off, the machine stops, but renews its operation automatically whenever gas is desired.

In the illustration the various parts of the apparatus have been disposed in a single room; but in practice they can be so distributed and arranged as to meet the conditions of the building in which they are placed.

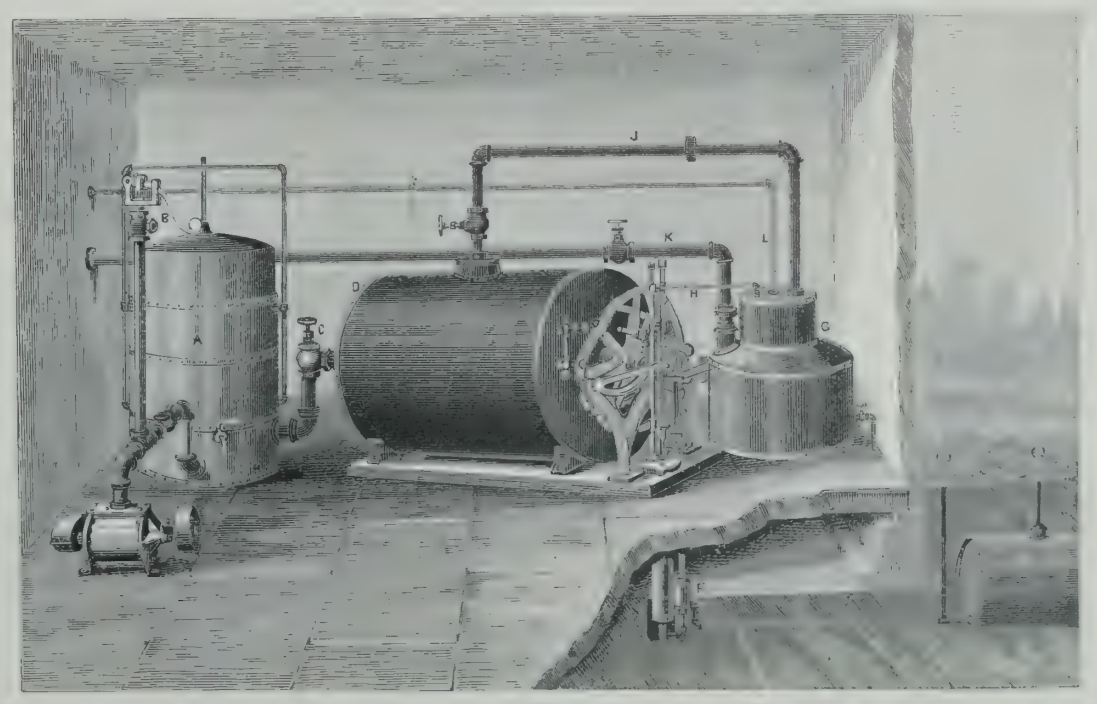
The amount of steam used is trifling, as there is no large body of air or naphtha to be heated, but a very small amount of naphtha at any one time requires to be volatilized in the converter.

The inventors of this apparatus claim that the gas produced is of absolutely unvarying quality, and is supplied in accordance with the amount required by the burners. The demand may be very large or very small; the service may be constant or intermittent; but the apparatus will always conform with the requirements of the consumer.

They also claim that this apparatus does as well on the last gill of naphtha as when there is a full tank supply, and that the combination of air and naphtha is such as to insure against condensation. They claim further that the naphtha is kept underground with no pressure upon it whatever, and is withdrawn and conveyed to the converter through a very small pipe. The apparatus has been favorably passed upon by the insurance authorities, and is allowed to be installed in city premises even having no yard space.

The inventors state that the fuel gas made by the apparatus produces an intense and extremely cheap illumination with incandescent burners, and is designed for lighting small towns, hotels, institutions, etc., and for fuel purposes for factories, etc.

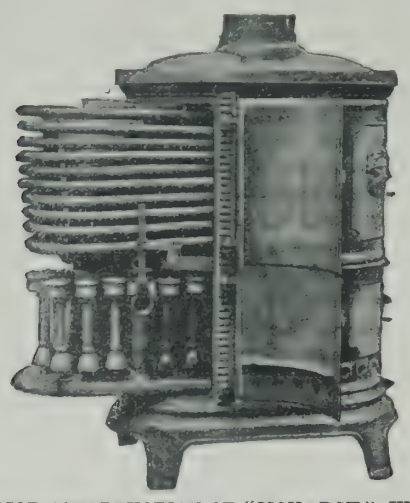
The manufacturers have other modifications of the apparatus adapting it to be operated by water service.



THE KEMP GAS-GENERATING APPARATUS.

AN EFFICIENT WATER-HEATER.

THE "Monarch" is an instantaneous, automatic water-heater, containing from ninety to two hundred and sixty feet of copper heating-coil, and furnishing from three to twelve gallons of hot water per minute. The heater is



INTERIOR CONSTRUCTION OF "MONARCH" WATER-HEATER.

controlled entirely by the opening of any hot-water faucet, and consumes gas only as water is drawn—a feature of no little value, since in heating water automatically it is of the utmost importance to control the flow of gas according to the increased or diminished flow of water.

Unless complete combustion is obtained, when gas is used as a fuel, a waste is incurred. In the burner used in the "Monarch" heater, complete combustion is obtained, so that the gas is entirely burned and the formation of carbon avoided.

A heater, when tested at the factory before shipment, will heat four gallons of water with a consumption of three and one-quarter cubic feet of gas. Making the proper allowance for the different conditions which obtain at different places, the makers claim that, with gas at one dollar per thousand cubic feet, it will cost five cents per day to heat fifty gallons of water—more than can usually be obtained from a kitchen boiler. With natural gas at twenty cents per thousand feet, it will cost just one cent per day to heat fifty gallons of water at an average temperature of 55 degrees.

The manufacturers of the heater are the Monarch Water-Heater Company, of Pittsburg, Pa.

Shell Windows.

AMONG the various and curious objects brought from Manila by some of our returning soldiers, none excite more interest than the delicate, plate-like shells called conchas; not only because they belong to the usually unattractive and rough-shelled oyster family, but from the fact that shells serve as windows in many of the buildings in the Philippines.

The shell is nearly round, about four inches in diameter, compressed, and so thin that it is nearly transparent. In appearance the interior of the shell resembles isinglass, with opalescent tints, the exterior being slightly rough. The animal is so exceedingly flat that when the valves are closed they apparently touch. This is probably the same species of mollusk which is known in China as the Chinese window oyster, and which is used for windows, lanterns, and similar purposes. These ingenious people also powder the shell, which they use for silver in their water colors.

The better class of houses in Manila have window-frames which slide in grooves, so as to be opened or closed as desired, and in these are set the conchas, which soften the bright tropical sun rays. As a further protection against light and heat, blinds are used which run in the grooves with the windows. The Governor's Palace, which was rebuilt about 200 years ago, has for windows the same sliding frames set with many panes of the window oyster.—From Our Animal Friends.

Elevators for Safes.

IN the lower business section of New York city there is scarcely any sight that attracts more attention than the raising of a safe to the fifth or sixth story of a building. There is little or no protection for the passers-by who do not heed the little red sign marked "Danger." While the accidents have been comparatively few, there is an element of danger in connection with the work which is unavoidable so long as the safety of the heavy piece of furniture and the safety of the passers-by depend upon a manila rope. In some of the newest office buildings in New York the difficulty of safe moving is entirely eliminated by the construction of a special elevator in the building. The safe is rolled into the elevator, using iron plates which distribute the weight over the floor. The elevator has a capacity of four and a half tons. The floor of the elevator is laid with four inches of planking, and after the safe is rolled in the elevator moves to the desired floor at its ordinary speed. In unloading the elevator a great strain would naturally be brought upon the cables, but special means are provided for throwing into service four tumblers, which hold the elevator firmly so that the safe may be rolled from the car into the office.

THE FOX STEEL SASH PULLEY.

In our issue of April, 1899, we described and illustrated a most efficient and ingenious pulley made by the Fox Machine Company, of Grand Rapids, Mich. Since the appearance of our article, the company has introduced two new types of sash pulleys, known as Nos. 7 and 9.

The pulleys in question are made of one piece of steel drawn in shape, with the ends so formed that they will fit a hole bored by a $\frac{1}{16}$ inch bit. The pulleys will fit into an oblong mortise made by a mortising-machine, or will fit equally as well into four holes bored with a $\frac{1}{16}$ inch bit. In the form illustrated, it will be observed that the pulley is flanged at the top to prevent it from passing through the mortise.

Since the pulley is drawn in a die, and the flange is drawn at right angles on the top, a most rigid construc-

NEW FOX PULLEY.

tion is obtained, making it impossible to spring the metal against the wheel. It is in this particular feature that the Fox pulley differs from all others.

The wheel used in the pulley has the well-known Fox double-shouldered steel bushing, which, in connection with the steel rivet, enables the pulley to run noiselessly and with but little friction. The method of inserting the pulley has been described in the issue mentioned.

A NEW TYPE OF HAND PLANER AND JOINTER.

THE machine illustrated herewith embodies various improvements in construction which will be appreciated by experts.

Expert operators in using hand planers stand close to the machine. In fact, one foot must project inside or under. The frame in this machine on the front side is recessed, giving the operator greater advantages for steadiness and quick work.

The front table is operated by the large wheel in front; and the operator can set from the front or from the end without loosening any bolts. Both tables are fitted with steel lips where they approach the cutters, allowing them to be brought closer together. The frame is one entire casting, and, being extra heavy, enables the machine to run very smoothly without any vibration. The front table is four feet long. The frame and inclines come under the tables, and give them full support to the outer ends.

The cylinder and journals are of the best forged steel. Two sides of the head are plain to receive the long knives, the other two slotted, for use of beading, molding, and other cutters. The journals are of large diameter, long, and run in self-oiling boxes, constructed so as continually to supply sufficient oil to the journals.

Suitable and easy adjustment is also provided for making hollow joints for glue jointing. The machine is capable of a full line of work, such as glue joints, planing out of wind, etc.

The patent adjustable fence is stationary at the table, and inclines from the top part. The fence is fastened on the back table, is secured just where the operator presses the work, and is free from spring.

The builders of this new machine are the Egan Company, No. 209 to 229 West Front Street, Cincinnati, Ohio.

New Building Material in Germany.

CONSUL WARNER writes from Leipzig, April 26, 1899: "My attention was recently called to an article headed 'A New Building Material: Keramo,' which appeared in the Leipziger Tageblatt, of which the following is the substance:

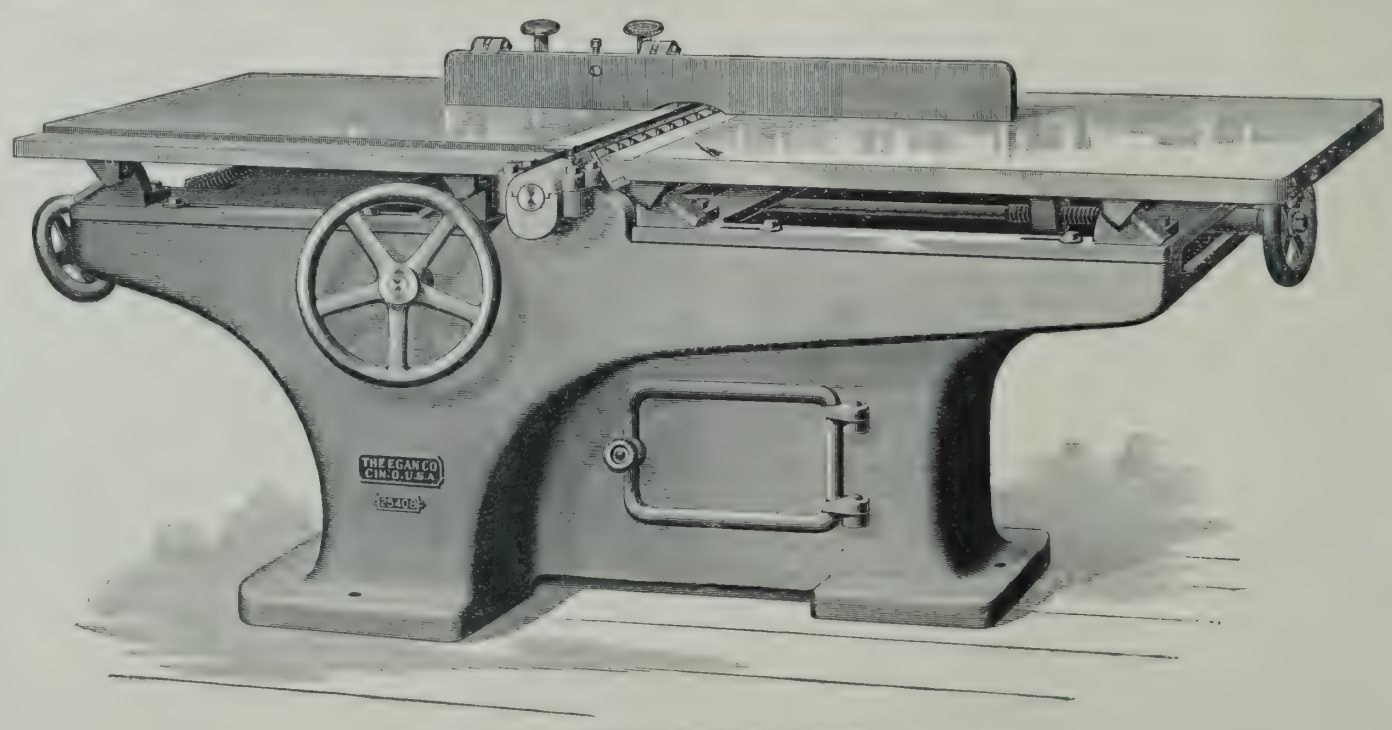
Under the name of 'keramo,' a new building material, composed principally of glass and manufactured at Penzig, Silesia, has been placed on the market. As far as known, this material is made from powdered glass waste, which is hardened by a special devitrifying process and combined by means of strong pressure. In this way, the transparency, brittleness, and fragility of the glass are destroyed, but other prominent properties—extraordinary hardness, stability against exposure to the weather, non-conduction of heat, non-inflammability, insensibility to oil, grease, acids, etc —are retained in this new material.

Keramo can be used with good results for wainscotings in the interior of buildings, for covering floors in houses, kitchens, washing-rooms, verandas, balconies, etc., for rough casting of walls exposed to the weather, as well as for staircases which are to be fireproof. The color depends upon the color of the glass used in the manufacture. The price of keramo is about $1.60 per square yard, and, so far, the trials which have been made with this product have been most successful."

Trees Growing in Churches.

A CURIOSITY of vegetation exists in the shape of a good sized pine tree growing on a ledge of a façade of the ancient cathedral church at Fenioux (Charente Inférieure), France. This is paralleled by the tree which grows out of a window of the round tower at the Church of St. Benedict, Norwich, and many other instances in the United Kingdom. In the old church of Ross, in Herefordshire, two thriving elms are growing, one on each side of a passage between the pews. They are said to have sprung up from the pavement beside the pew once occupied by John Kyle, who, at considerable expense, planted elms about his native town.—English Home Magazine.

RARELY has it been our good fortune to receive a more artistic catalogue than that which has been sent to us by The Winslow Brothers' Company, designers and workers in bronze and ornamental iron, of Chicago, Ill. The beautiful half-tone illustrations which grace every page lend to this catalogue an interest which hardly attaches to the ordinary trade publication.



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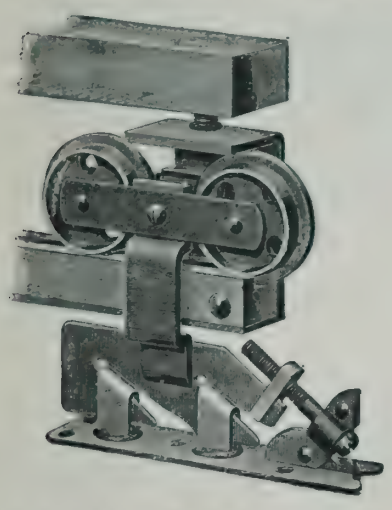

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Adjusted Through the Track Without Removing Woodwork.

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have heat-saving chambers, so that one open fire will warm several rooms on one or different floors, in coldest weather. These grates heat an entire residence better, and with less fuel, than a furnace or steam heater. They can be set in any fireplace, and will burn any kind of fuel.

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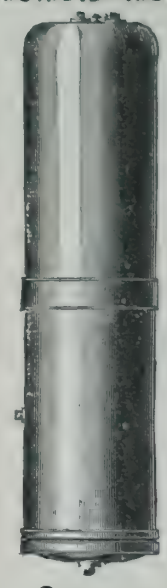

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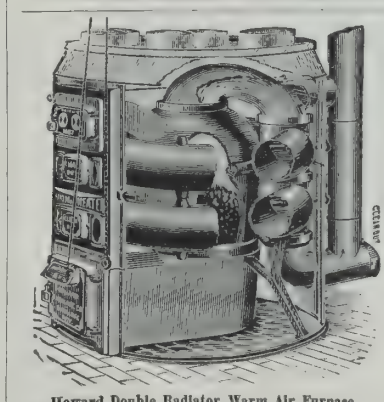

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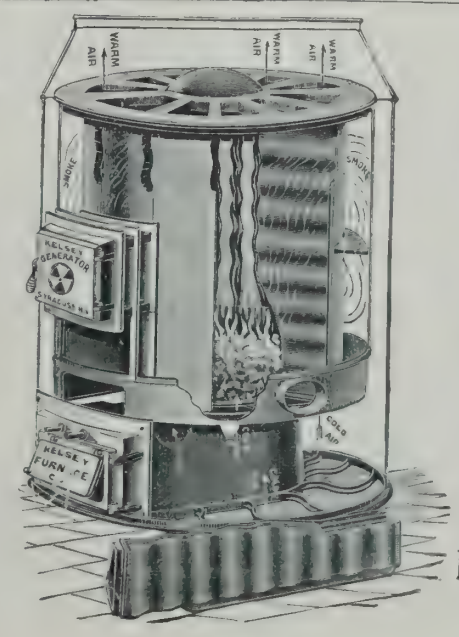

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Gentlemen: We are thoroughly satisfied that Calcimo is better adapted to tinting and decorating purposes than whiting or any other tinting processes we have tried, being more economical and having excellent working and covering properties. The Cold Water Size is invaluable as a time saver.
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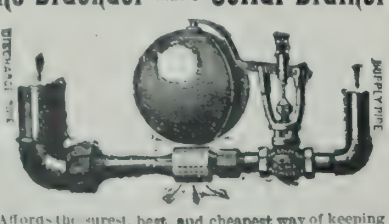

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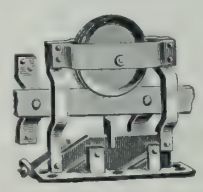

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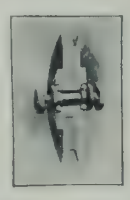

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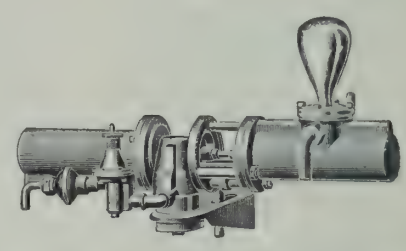

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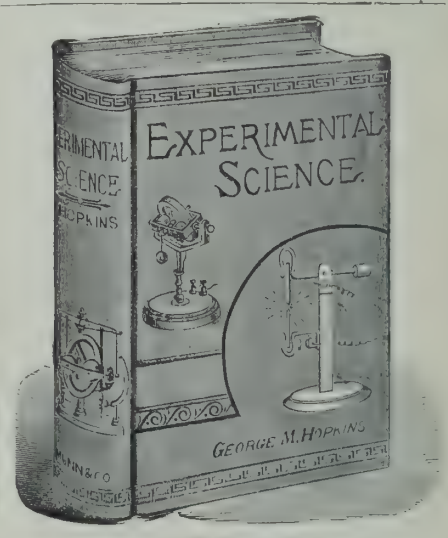

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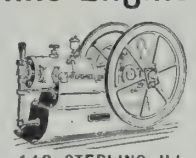

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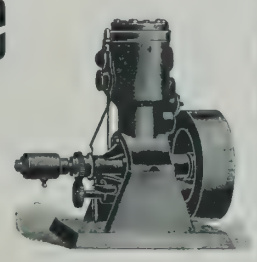

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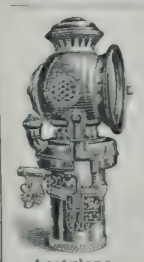

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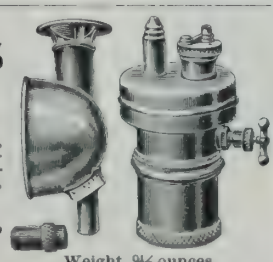

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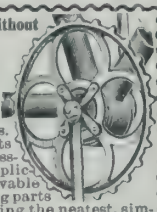

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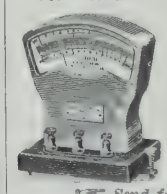

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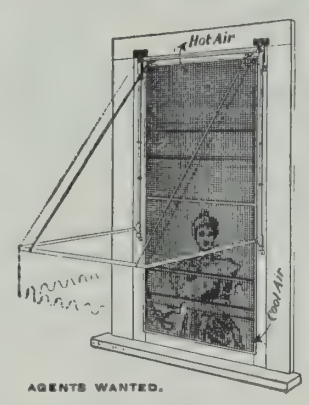

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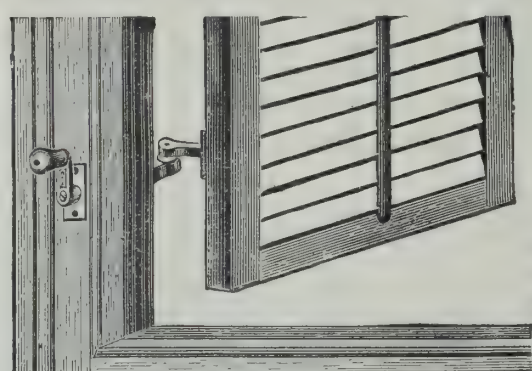

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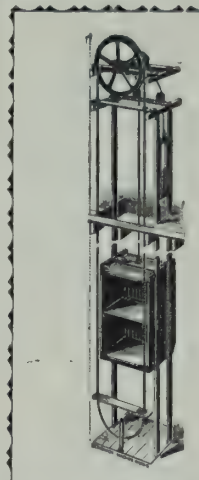

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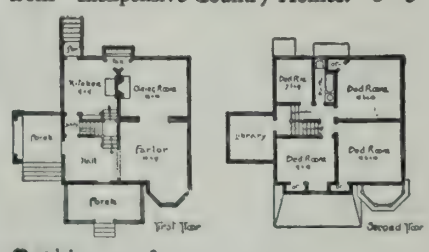

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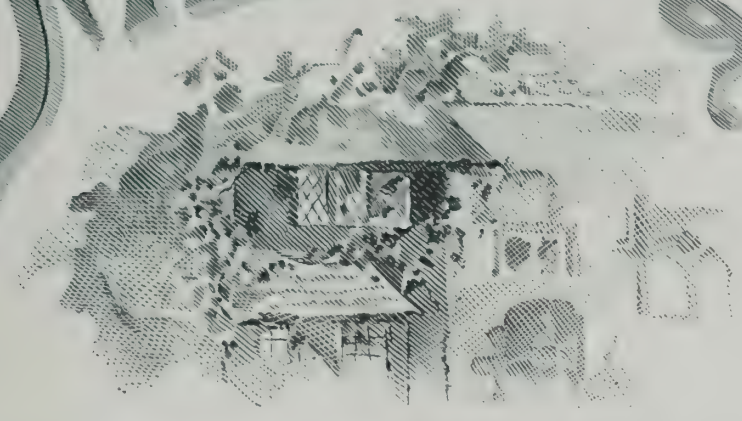

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A VIEW OF CHURCH OF THE NEW JERUSALEM, SAN FRANCISCO, CAL.—See page 35.

MR. A. PAGE BROWN, ARCHITECT.

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Scientific American,

BUILDING EDITION.

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MECHANICAL INFLUENCE IN ARCHITECTURE.

IN most popular writings on the subject of Architecture, and on the origin and development of architectural styles, the causes that are chiefly dwelt upon as affecting and influencing the forms and features of the various styles are climate, the temperament of the people, their artistic tastes, origin, traditions, occupations, etc. In short, the æsthetic and sentimental influences are credited with being the most important factors and the controlling causes in developing their national styles. The writers are undoubtedly right in taking all these matters into consideration, but it is not wise to neglect to notice the fact that one of the most influential factors in perfecting nearly all architectural forms has been purely mechanical, in devising the best methods of employing the materials at hand and the means used to overcome structural difficulties and resist natural forces. Mr. George W. Percy, a member of the Technical Society of the Pacific Coast, recently read a very interesting paper before that body which brought to light many important facts bearing on the subject. It goes on to say that in Chinese architecture the construction clearly shows the bamboo origin of it. The properties of bamboo are well known, and in a country where it is found in abundance, together with the fact that it is uniformly hollow with webs at intervals so that one part may slide inside a larger piece, is sufficient reason for making bamboo the principal material for house building, and the forms adapted by it are such as would naturally be developed in the continuous use of this peculiar material.

In Egypt, for example, the conditions are entirely different. With few trees of any kind, with no stones immediately at hand, the early Egyptians erected their dwellings and other buildings with mud, reeds, and bulrushes, which they had in abundance. On elevated platforms of earth they built thick walls of mud, with layers of reeds and bulrushes to bind the whole together. For greater stability they made walls battering on the outside, thus reducing the thickness as they approached the top. They set posts at the corners, consisting of bundles of reeds, in order to preserve true angles and a proper batter at the angles. A horizontal band of similar bundles of reeds marked the top of the wall proper and where the thick mud-roof should commence. This roof was supported by bundles of reeds laid close together, and in turn supported by the walls and by interior columns. To confine the mud or soft clay when applied to the roof, upright reeds were placed close together and secured to the horizontal band. These would naturally bend outward from the pressure of the clay on the inside, and thus produce a graceful and bold cove, which formed so conspicuous a feature in Egyptian architecture. When this people had so far advanced as to build their temples and tombs of granite, the traditional and still prevailing forms of their mud structures were copied to the minutest detail, and even the massive stone columns in their latest work show very clearly their reed origin, with their well-designed capitals of lotus, papyrus, and palm.

The development of Grecian architecture shows less clearly in the perfected temple the details of its prototype. The early habitations of the Greeks are usually conceded to have been of wood, and the log hut, with its projecting porch supported on upright trunks and trees, is supposed to have suggested the form of the temple and portico. As marble abounded in Greece, and the intelligence of the inhabitants was high, they devised and perfected forms and proportions more appropriate for their building materials. Instead of making monolithic columns as did the Egyptians, they selected sections from the thickness of the layers in the quarry and made drums, which were easily transported to the building. The Grecian columns are much more massive and set nearer together than could have been suggested by wood construction. The general form and application of all the parts are strictly adapted to the work they have to perform and to the materials in which they are executed.

In Rome, still another state of conditions is met with. The immediate vicinity of Rome did not furnish marble or other stone suitable to be used in large blocks, although soft volcanic tufa was obtained. The discovery of the arch, which is variously accredited, undoubtedly came from the valley of the Euphrates, where sun-dried and burnt bricks were the building material. The Romans carried the development of the arch to a high degree of perfection, and the round arch became the essential feature of early Roman construction. Instead of the arch being used as a decorative feature of Roman work, it is the vital principle of construction, while the Greek arches were applied largely as decorative appendages. A Roman monument may be deprived of all its decoration, and its apparent form removed without prejudice to its structure. In many cases the Greek arches have been stripped from the buildings for the sake of the marble, and the real Roman construction stands forth in all its dignity. The Pantheon, the largest dome of masonry in the world, is an admirable illustration of the Roman method of resisting the thrust of the arches with great masses of inert material, and not by active opposing forces, the walls of the Pantheon being twenty feet thick, and the dome of great thickness of solid concrete, with ribs of brick.

In the early part of the twelfth century, while the builders of mediæval churches were struggling with the difficult problems presented, a happy solution was evolved in the pointed arch. Its many advantages soon became apparent, and the round arch was abandoned at once, as it reduced the thrust one-half and allowed arches of many different spans to be brought to a uniform height with graceful intersections and secure construction. The pointed arch not only solved the mechanical difficulties of this church-building age, but lent itself so naturally to the upward tendency that a new impetus was given, and churches and cathedrals designed and commenced in the Romanesque style were often carried up on the Gothic style to a much greater height than the original designers ever dreamed of. The intelligent application of the pointed arch to interior groined vaulting soon brought about the complete system of Gothic architecture, in which the entire load and thrust of the vaulting are concentrated at individual points, and the weight is transmitted to the ground by slender piers, while the outward thrust is received by flying buttresses reaching over the roofs of the aisles. These flying buttresses, instead of springing from thick and massive walls, rested against deep buttresses, which may be considered as so many sections of old Roman walls placed at right angles to the building line. In this ingenious and scientific manner the thrust of the lofty vaults is converged to the ground without obstructing the light required for the building, at the same time producing a charming architectural effect. Every portion and detail of a Gothic cathedral has its special duty, and in performing it give shape and character to the style. "It is a common delusion," says Mr. Percy, "that the intricate vaulting of the Gothic world was really an effort to imitate the interlacing branches of the forest trees, or that the origin of the pointed arch took its rise in the intersection of the interlacing of semicircular arches, as was often the practice in wall decoration in Norman architecture in England. Others, again, think that the builders simply were seeking new forms, while others think that the returning Crusaders introduced the pointed arch, having obtained their knowledge from the Saracens." They have many other theories, but Mr. Percy dismisses the matter by saying: "It was in effect such inspirations as in our day put eyes in the points of needles and gimlet points in the ends of screws—the inspiration we call invention, the child of necessity."

THE SELECTION OF WALL PAPER.

EACH year the variety of wall papers shows a decided increase, and their artistic merit is constantly greater. Manufacturers both at home and abroad are employing the best designers, and the wall papers of twenty years ago could hardly be sold to-day with advantage. In smaller houses, especially where the decoration is confined within moderate limits, there is, at the present time, a great range of low priced papers, which add materially to the appearance of the room. Where a room is to be decorated and papered, it is the best plan to first select the wall paper. In a majority of cases the choice is made in the store of the manufacturers, or more often in the establishment of a painter or decorator. This is only fairly satisfactory, however, and, after the selection has been narrowed to two or three patterns, the rolls should be taken home. It is impossible for any one who has not had considerable experience to judge of the effect from a small piece such as are found in pattern books, and much disappointment has often resulted from this cause. The paper in a small piece looks very different from its appearance when on the wall. A roll of paper should be taken and pinned to the wall at its full height, so that it may be viewed in the actual position it will occupy. There is a further advantage in this method, which is that the eye does not get dazzled and the mind confused, as they are sure to do if a large number of patterns are examined in quick succession. Decorators all know how often people choosing hangings and colors will, from this cause, finally decide upon what they had at first rejected, and without having the slightest idea that it is so. The wall paper being once selected, it is easy to decorate the room appropriately.

ART AS AN EDUCATIONAL FORCE.

ONE of the most interesting papers which was read before the recent meeting of the National Education Association was one by Prof. Elmer E. Brown, of the University of Chicago, on "Art in Education." Professor Brown began by saying that when we speak of art in education we are not to understand that we are speaking simply of a division or ingredient of education, but we are speaking of one of those vital elements which pervade the best education and make it worthy of the name of culture. In the sense of the beautiful, and whatever gives it strength and clearness, there is a subtle and pervading sense of culture which goes with its possessor wherever he may be. It pervades, invigorates, and vitalizes a man's thoughts. We can have no patience with an education which merely affects a man piecemeal. Schools should transform and ennoble the human mind, so that one who is educated shall be different in everything he does from what he would otherwise have been. The taste which is quickened by the sight of a noble picture is a new power for the appreciation of other pictures. The current demand for a larger artistic element in the instruction in schools ought not to be considered as a demand for one more thing in our already crowded school curriculum; it is rather to be regarded as a growing recognition of one of the essential and universal aspects of instruction. It is not desirable that a schoolroom should be so decorated that it seems like fairyland when a child first enters it, but he should find in it the things which grow upon him as he continues to live with them.

The views of Professor Brown are eminently sound, and we have already on other occasions described how the schoolroom can be decorated with pictures and casts at moderate cost. In the Children's Room of the Boston Public Library there are a large number of great bromide enlargements of masterpieces of art, and it is instructive to see the children looking at Donatello's "St. George" or the "Certosa of Pavia." The cost of such enlargements is not prohibitive, and they are a great power for good.

A RESIDENCE AT SEA GATE, LONG ISLAND.

THE engravings on page 25 in this issue illustrate a residence recently completed for Henry Haugaard, Esq., at Sea Gate, Long Island. The exterior is treated in a very handsome manner, and it has many excellent features, good detail, and an interior arrangement which is most complete. The underpinning is built of brick laid up in red mortar. The exterior framework is covered with sheathing, and then shingled and stained a dark green color, while the trimmings are painted cream yellow. The roof is shingled and finished in its natural silvery gray color. Dimensions: Front, 43 ft.; side, 40 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The interior throughout is trimmed with oak finished natural. The entrance is into a large open living-room, which is separated from staircase hall by an archway supported on columns and pilasters. This living-room has a beaded wainscoting and a paneled ceiling. It has also an open fireplace built of Tiffany brick, with hearth and facings of same, and a hardwood mantel with carvings, columns, and mirror. The staircase is a handsome one turned out of oak, and is lighted effectively by stained glass windows on second landing. The toilet, under this stairway, is fitted up complete, and is a convenience. The library and dining-room are trimmed with oak, and each has open fireplaces furnished same as one in hall. The kitchen and its apartments are furnished with the usual fixtures and in a most complete manner. The second floor contains five bedrooms, nine closets, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and trunk room. A cemented cellar contains laundry and ample room for furnace. Mr. Henry Haugaard, architect, Richmond Hill, Long Island.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

"THE HALL," BRADFORD-ON-AVON.

IT is not at all surprising that the exquisite example of Jacobean architecture which we show in our engraving should have been chosen as a model of the pavilion which is to be erected at Paris for the Prince of Wales during the Exhibition of 1900. When this style of architecture came into existence, men turned their backs upon all that was ascetic and severe, and they were glad of some form of architecture which could give full expression to that new love of life. This beautiful mansion on the island was built by a member of the family of Hall, rich clothiers of Bradford, but the exact date of its erection has not been determined. There is no doubt, however, that it belongs to the reign of James I. It was restored by the present owner, Mr. John Moulton, in 1894. It was formerly known as the Kingston House. The site of The Hall affords little scope for landscape gardening or for the formation of a park, because within fifty yards of it is an India rubber works, only partially hidden by a belt of trees and shrubs at the bottom of the lawn. The whole grounds are, nevertheless, remarkably secluded, and, though hidden from view, the sound of the waters of the Avon rushing over the weirs may be heard as they speed through the charming valley. The scenery in this part of Wiltshire is charmingly picturesque and attractive. The gardens are formed in terraces, and shrubbery plants mask the garden wall. The upper lawn is devoted to a tennis court, and is a pleasant resort where gay flower borders creep up to the sward. At the back of the flower border, at the upper side, are several rows of ornamental shrubs quaintly trained with elms, pines, and other trees. These shrubs impart a certain picturesque charm, and stand in contrast to the masses of blossom which fill the border. Some ten feet below is another lawn devoted to bowling, a fine old English game which is becoming more and more popular every year. Here the terrace wall is covered with peach trees, perfectly trained and in full vigor. The borders by the lower terrace walls are filled like the others with hardy flowers; their brilliant color in summer time being relieved by standard and other roses.

The house itself consists of a square or rectangular main building, and three pavilions jut out on the front and terminate in bay windows. There are three gables, each of them being of the same size; there are two gables on the sides. The curious wreaths and obelisks so much used in Jacobean buildings are seen everywhere. Our view, which represents The Hall from the east, is taken from our English contemporary "Country Life Illustrated," as is also our description.

"THE HALL," BRADFORD-ON-AVON, ENGLAND.—A FINE EXAMPLE OF JACOBEAN ARCHITECTURE.

A MODEL COTTAGE AT LARCHMONT, N. Y.

THE engravings shown on page 26 in this issue illustrate a model cottage which has been erected for A. B. Duffy, Esq., at Larchmont, N. Y. The design presented is most excellent. It combines elevations both pleasing and attractive and a well arranged plan; and it is a difficult matter to secure a combination like this at so low a cost, but the architect has been successful in this instance, and the design presented is unusual in its treatment for a building of this character. The underpinning is built of rough stone laid up in a neat manner. The building above is covered with sheathing, and then with cedar shingles, left to weather finish a natural silvery gray, while the trimmings are painted buff. The roof is shingled also and finished similar. Dimensions: Front, 22 ft. 4 in.; side, 24 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 8 ft.; second, 8 ft. The interior throughout is trimmed with whitewood, treated in colors. The interior is treated in a most unique and complete manner. The entrance is through a "Dutch" door into a lobby, from which rise the stairs, and beneath which the cellar stairs descend. At one side is the living-room—a parlor—which is provided with a neat wooden mantel, and at the other side a dining-room, provided with a china closet and an entrance into kitchen. The kitchen, of large dimensions, is wainscoted and furnished with a large pantry and sink, and also an open fireplace for range. The second floor contains three large bedrooms, with closets well fitted up. A cemented cellar under house. Cost, $1,500, complete. Mr. S. Edson Gage, architect, Lincoln Building, No. 3 Union Square, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODEL DWELLING AT HOMEWOOD, LONG ISLAND.

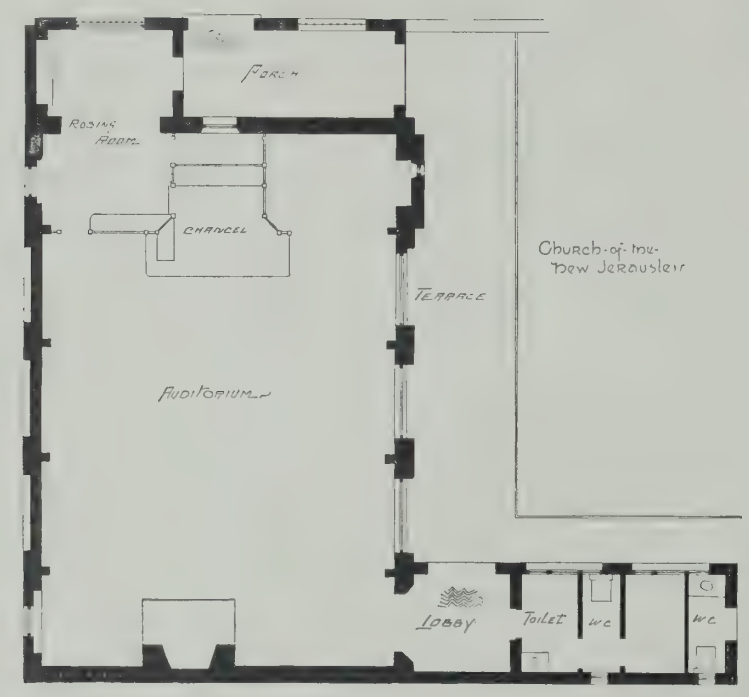
WE present on page 27 a model dwelling which has been erected for the City and Suburban Homes Company, at Homewood, Long Island. The building is treated in the Elizabethan style, and an effective use has been made of brick and stucco in combination with half-timber work. The underpinning and first story are built of rough-faced brick, while the remainder of the building above is beamed in an artistic manner, with the spaces between beams covered with plaster. All the woodwork is stained a dark umber. The roof is covered with slate. Dimensions: Front, 22 ft.; side, 41 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft.; third, 7 ft. 6 in. The plan of the interior is most excellent, and is well arranged and handsomely finished off. The interior is trimmed throughout with white pine, finished natural. The hall contains an ornamental staircase, with newel posts and balusters turned out of similar wood. The parlor is separated from hall by sliding doors, and it contains an open fireplace built of brick, with hearth and facings of same, and a mantel made from special design. The dining-room has also an open fireplace of similar character, and a bay window with flower seat. The kitchen and laundry are fitted up with all modern conveniences. The second floor has five bedrooms, six closets, and bathroom, the last wainscoted and furnished with porcelain-lined tub, closet, and lavatory. The third floor contains two large bedrooms. A cemented cellar contains the usual necessary fixtures. Mr. Percy Griffin, architect, No. 48 Exchange Place, New York city, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

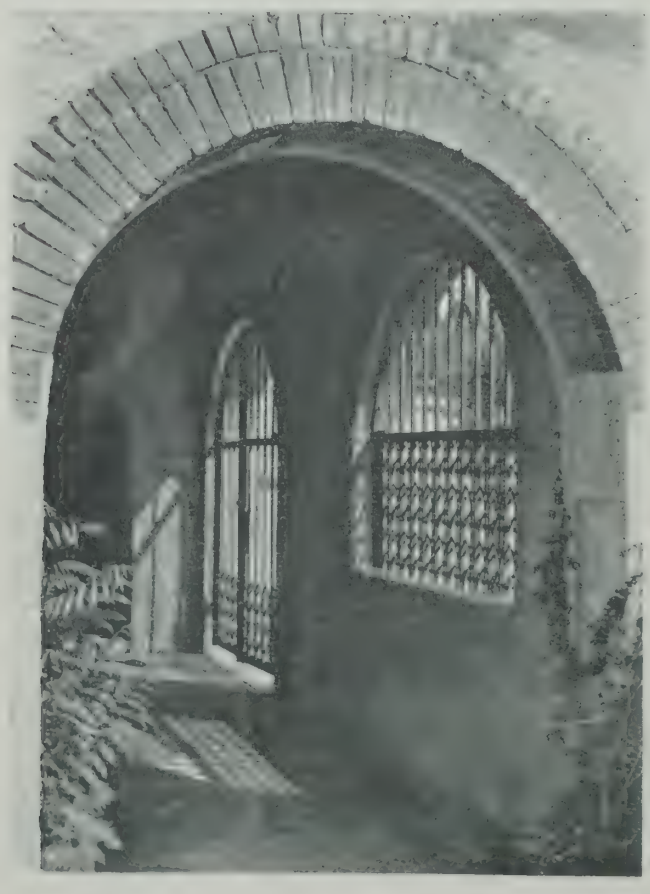
A MODERN DWELLING AT BOGOTA, N. J.

WE present herewith on page 30 a modern dwelling which has been erected for Mr. Samuel T. Chambers, at Bogota, N. J. The design is treated in a modern style, and the plan is arranged conveniently. The underpinning is built of red brick laid up in red mortar. The superstructure, of wood, is covered with clapboards on first story, and shingles on second and third stories. The clapboards are painted a light olive green, with dark bottle green trimmings. The shingles are stained a dark brown. The roof is shingled and stained a dull shade of moss green. Dimensions: Front, 28 ft.; side, 32 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior is trimmed with white pine throughout. The hall contains an ornamental staircase, turned out with newels, posts, balusters, and rail. The parlor and dining-room each have octagonal projections and open fireplaces, trimmed with tiles and provided with mantels of oak. The kitchen and its apartments are fitted up complete. The second floor contains three bedrooms and bathroom, the latter wainscoted and furnished with the usual fixtures replete. The third floor or attic contains ample storage room. A cemented cellar contains furnace and other necessary apartments. Cost, $2,200 complete.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.



Church of the New Jerausler



VIEWS OF CHURCH OF THE NEW JERUSALEM, SAN FRANCISCO, CAL.—See page 35.

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A RESIDENCE AT SEA GATE, LONG ISLAND.—See page 22.

MR. HENRY HAUGAARD, ARCHITECT.

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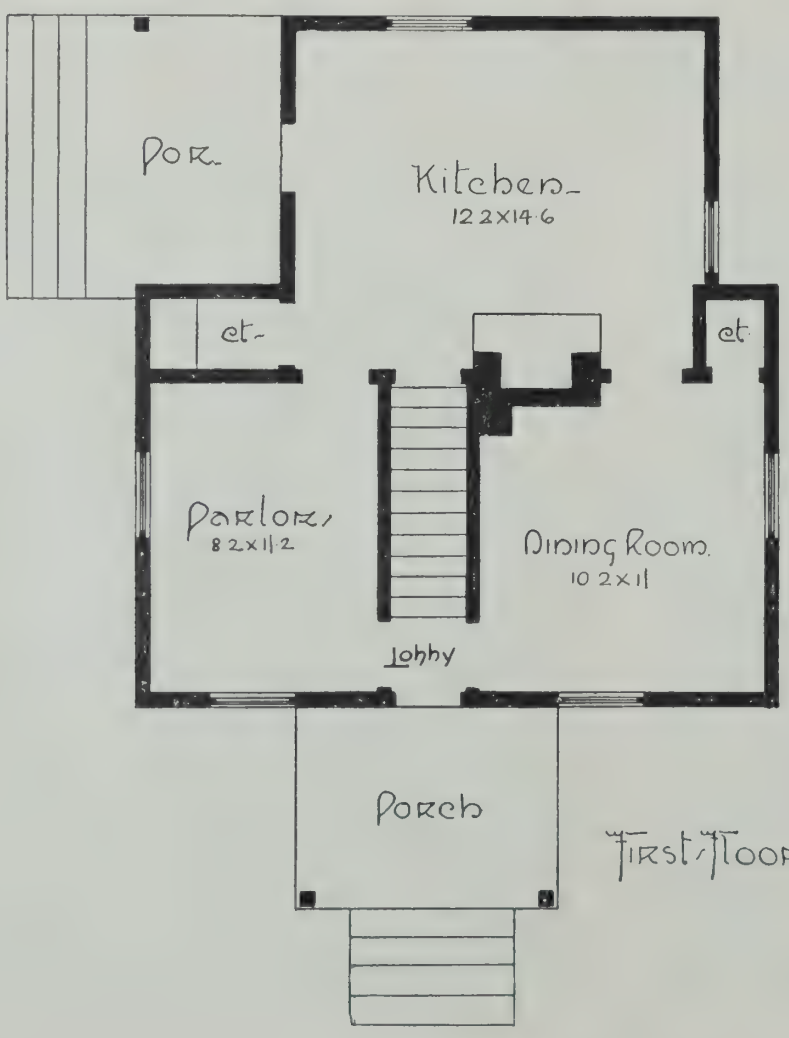
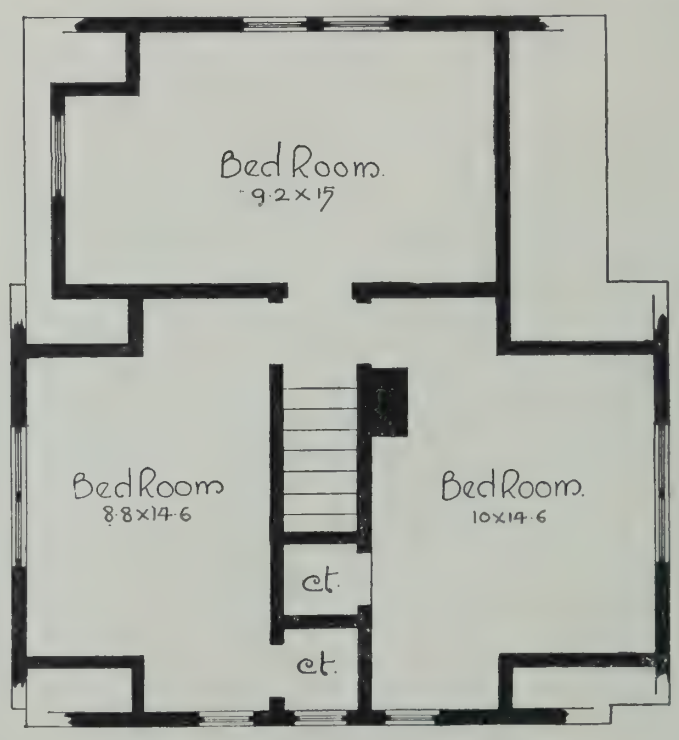


First Floor



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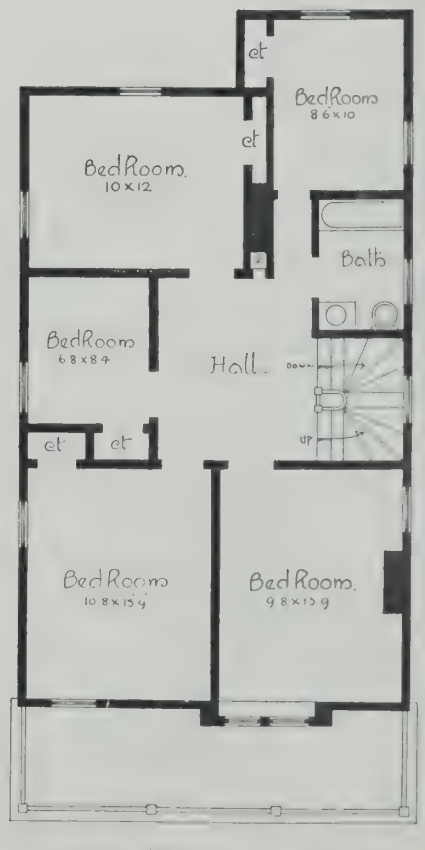

A MODEL DWELLING AT HOMEWOOD, LONG ISLAND.—See page 23.

MR. PERCY GRIFFIN, ARCHITECT.

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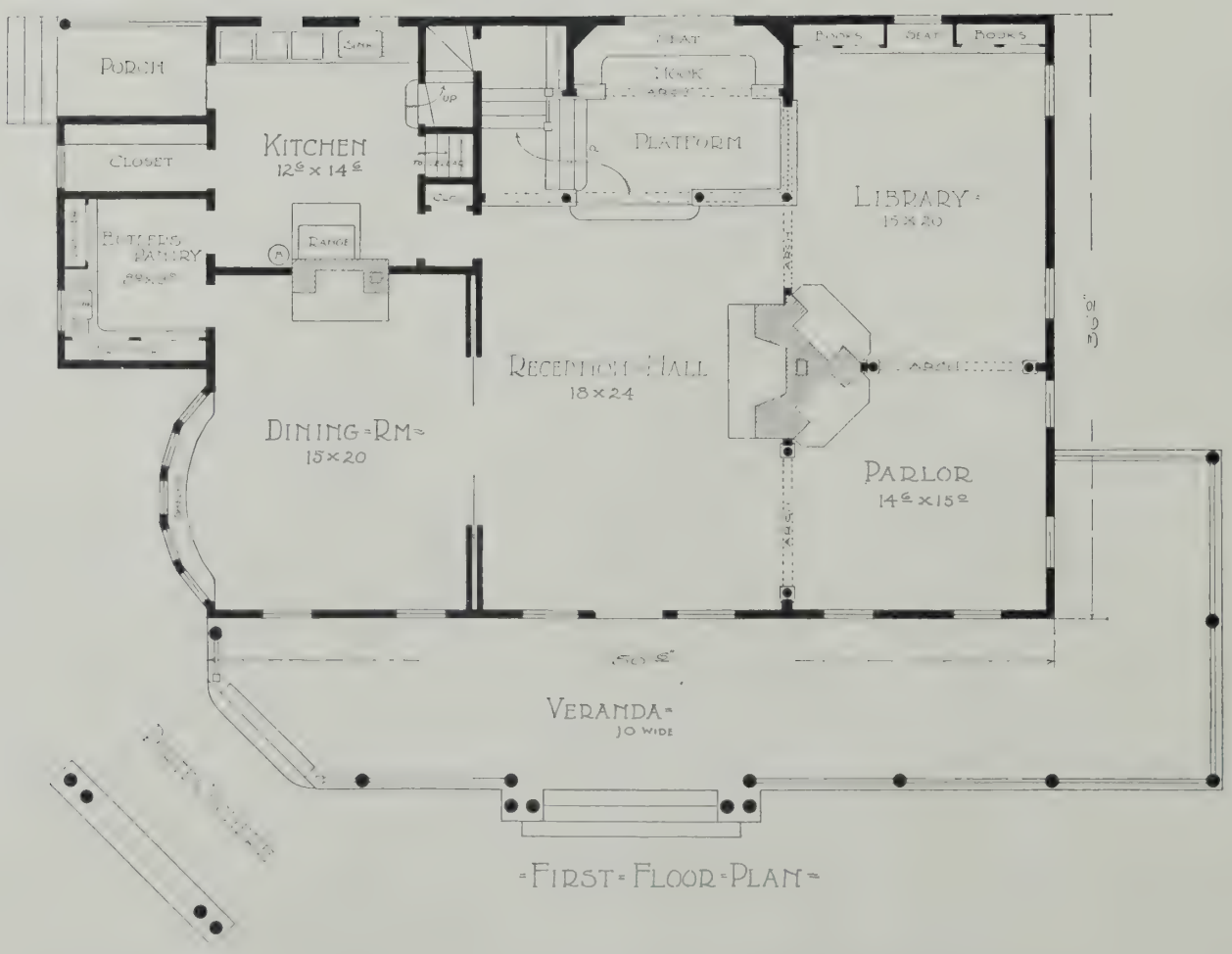

A MODERN COLONIAL RESIDENCE AT NEW NETHERLANDS PARK, WHITE PLAINS, N. Y.—See page 36.

MR. WILLIAM A. LAMBERT, ARCHITECT.

SECOND-FLOOR-PLAN

A MODERN COLONIAL RESIDENCE AT NEW NETHERLANDS PARK, WHITE PLAINS, N. Y.—See page 36.

MR. WILLIAM A. LAMBERT, ARCHITECT.

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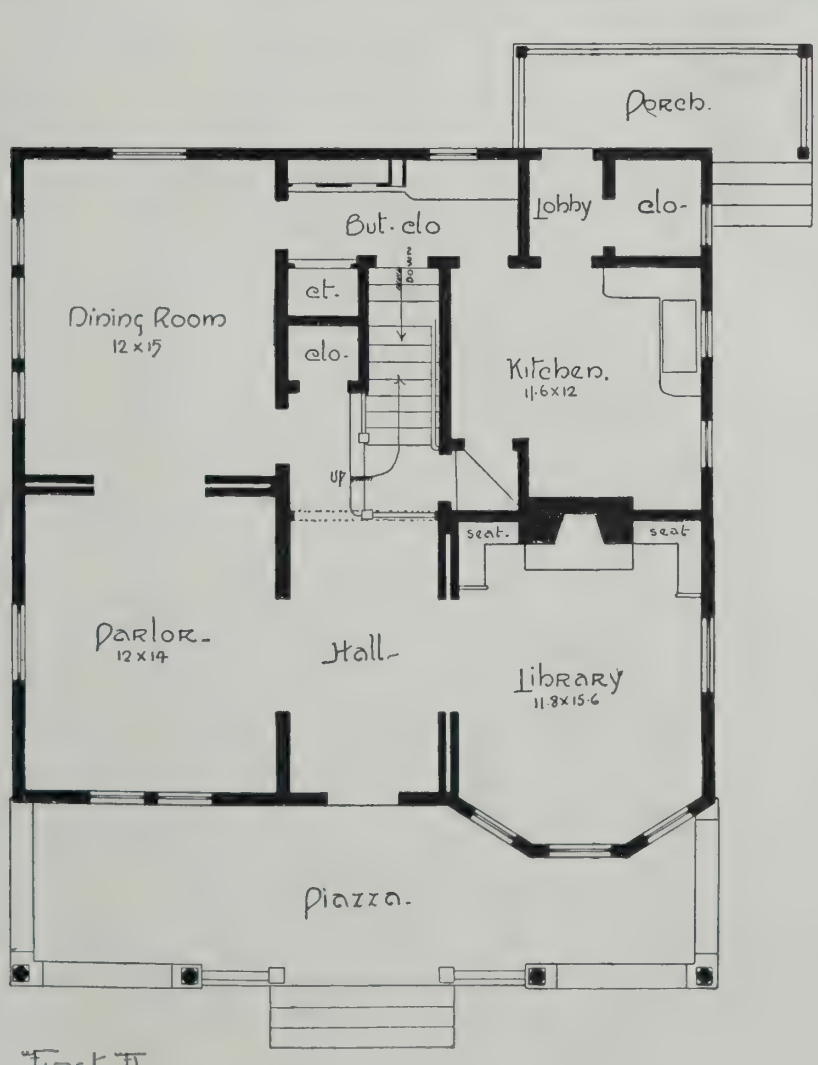
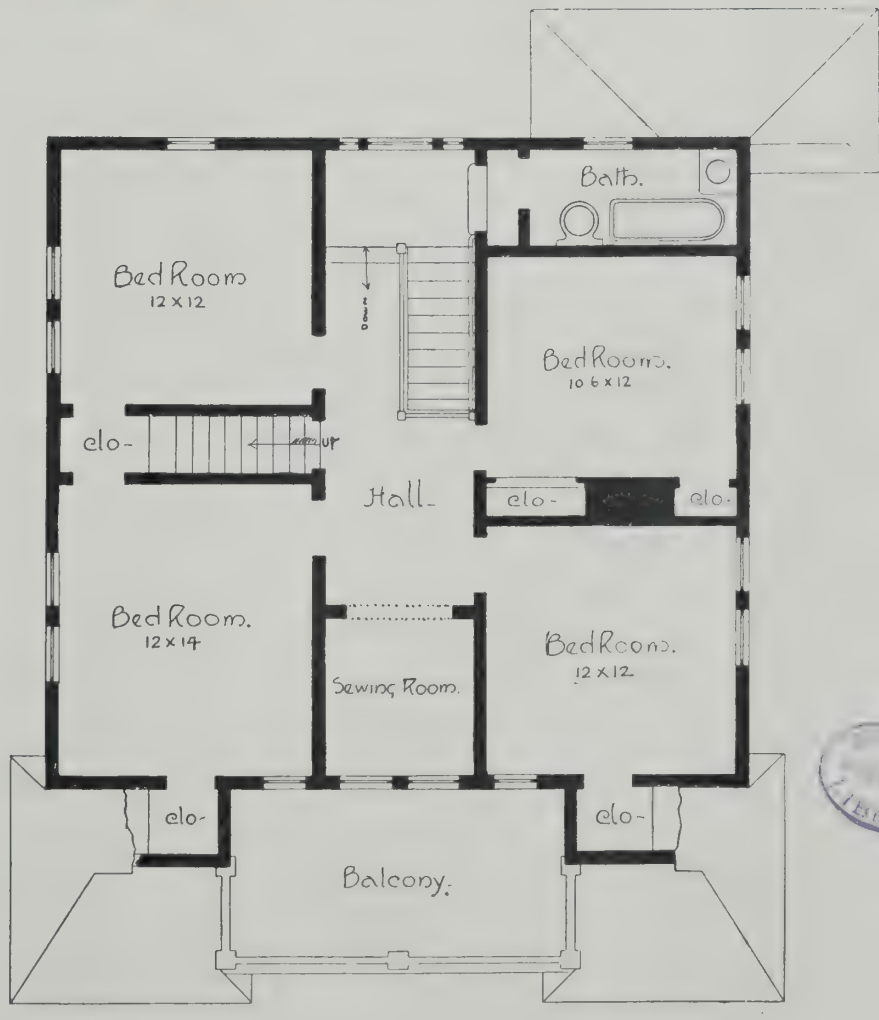
A MODERN DWELLING AT BOGOTA, N. J.—See page 23.

RESIDENCE OF MR. SAMUEL T. CHAMBERS.



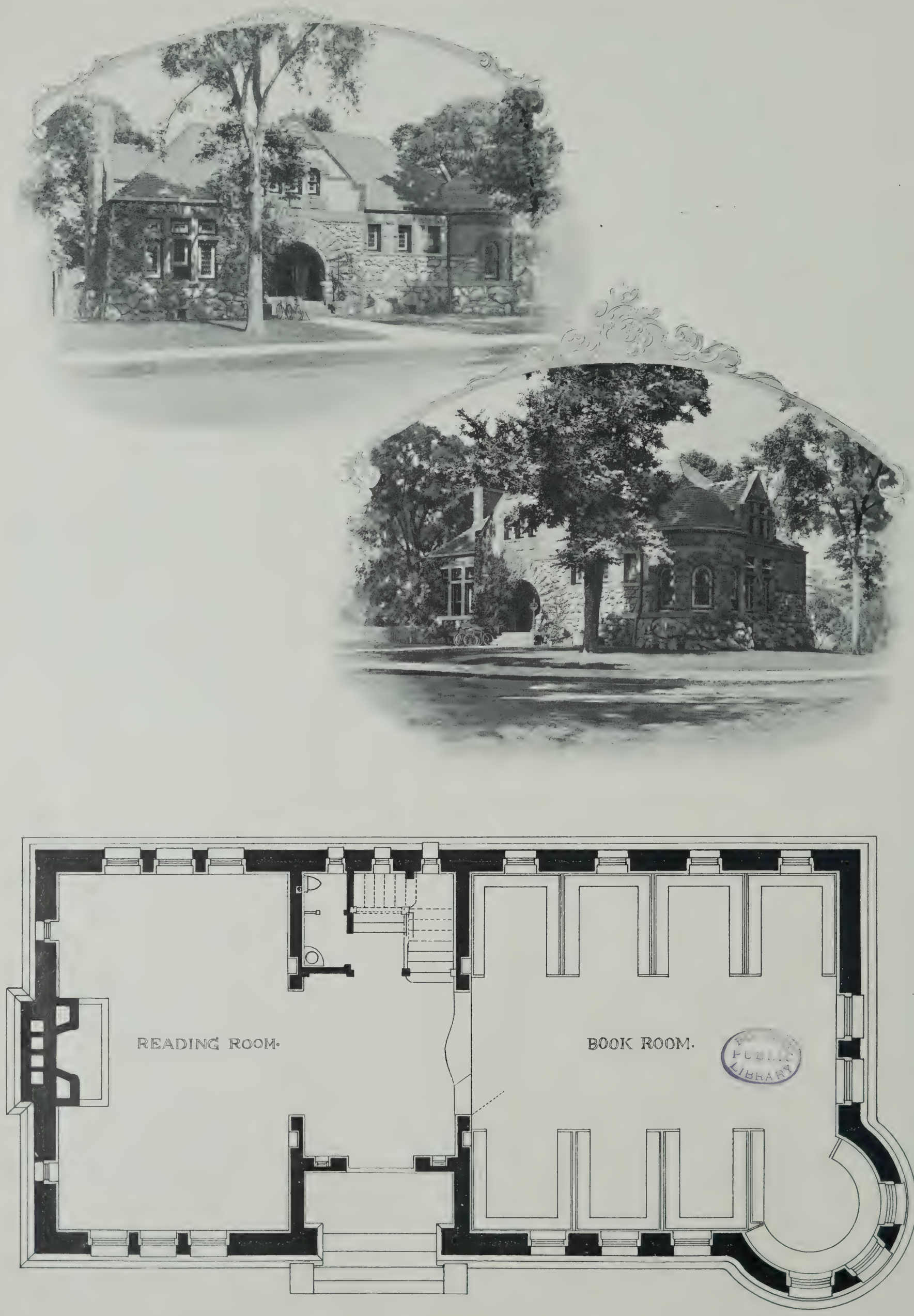
First Floor.



Second Floor.

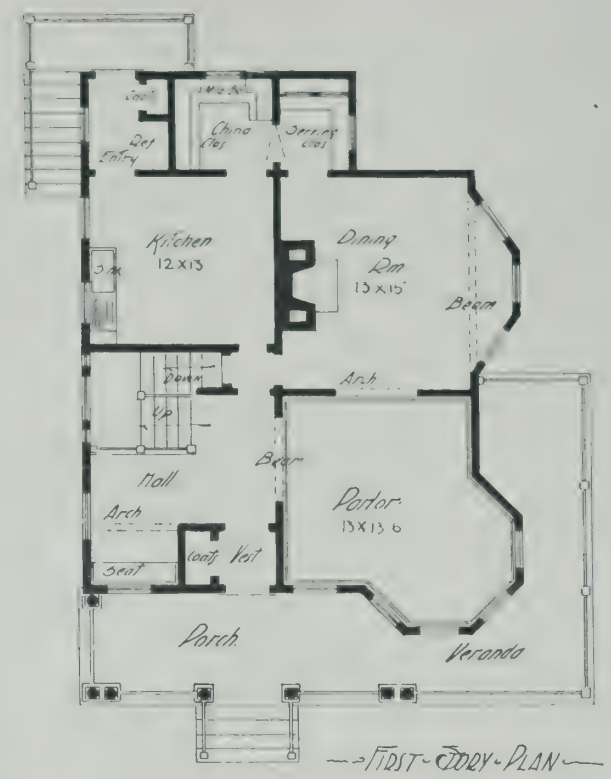
A MODERN DWELLING AT "FOREST PARK HEIGHTS," SPRINGFIELD, MASS.—See page 36.

LOUIS FRANK NEWMAN AND CARROLL H. PRATT, ARCHITECTS.

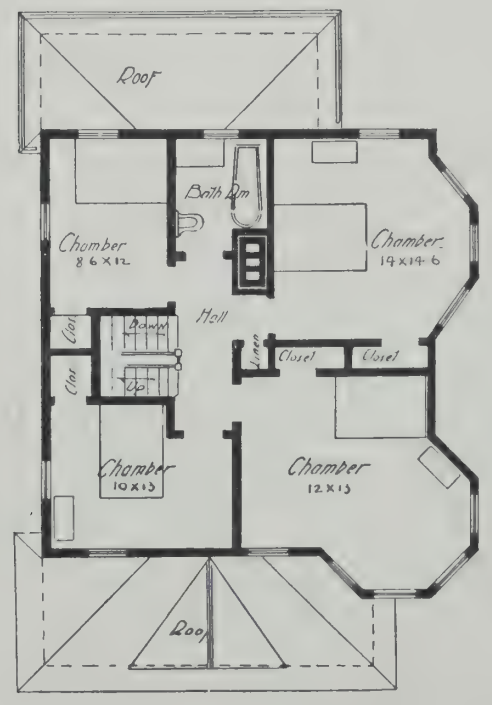


THE TAYLOR MEMORIAL LIBRARY AT MILFORD, CONN.—See page 36.

MR. JOSEPH W. NORTHROP, ARCHITECT.



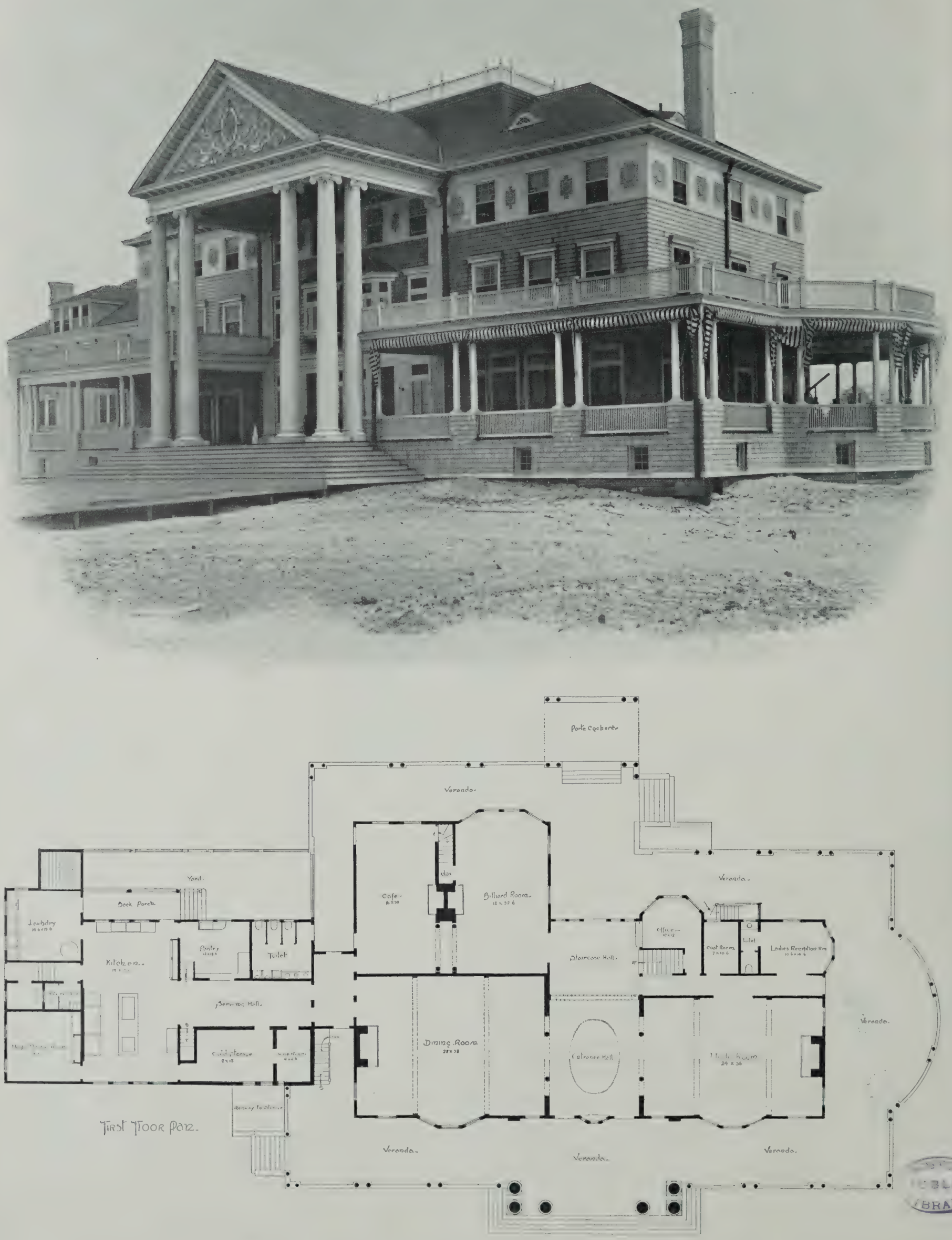
FIRST STORY PLAN



SECOND STORY PLAN

A MODEL COTTAGE AT STONEHAM, MASS.—See page 35.

MR. E. R. B. CHAPMAN, ARCHITECT.



THE ATLANTIC YACHT CLUB HOUSE AT SEA GATE, NORTON'S POINT, LONG ISLAND.—See page 35.

MR. FRANK T. CORNELL, ARCHITECT.

THE ATLANTIC YACHT CLUB HOUSE AT SEA GATE, NORTON'S POINT, LONG ISLAND.

THE engravings shown on page 34 and below illustrate the new house erected for the Atlantic Yacht Club, at Sea Gate, Norton's Point, Long Island. The design is a combination of excellently arranged interior plans and elevations, treated in the English Colonial style of architecture. It is three stories in height, with broad, spacious, and well-shaded piazzas surrounding three sides of the building. Over this piazza, at the level of second story, is a balcony, and on the roof a roomy promenade. The broad portico, with its massive fluted columns with Ionic capitals rising up three stories, the broad entrance doors, and the overhanging bay windows at front are excellent features and give the building its principal character. The building is erected upon piles. These piles are planked on either side, forming a cellar under the building for the storage of boat fixtures. The cellar under kitchen extension has brick walls built in between planking. The exterior framework of the superstructure is covered with shingles, left to weather finish a silvery gray color, while the trimmings are painted cream white. The panels between windows at third floor are plastered and ornamented. The roof is shingled and stained a dull shade of moss green. The ground floor is divided in an admirable manner into commodious apartments. The interior is trimmed with cypress throughout, and the floors are laid with yellow pine. The main hall is furnished with paneled wainscoting eight feet in height and a beamed ceiling. The large well-hole opening into the second-story hall is a good feature. The office is conveniently located at the left of entrance. The staircase is an ornamental one, with turned newel-posts and balusters. The coat-room, ladies' reception-room, and toilet are conveniently located and fitted up complete. The model-room has a paneled wainscoting and pilasters rising up and supporting beams which run across the ceiling, forming deep panels. The fireplace is built of brick, with hearth and facing of same, and mantel, paneled and rising to ceiling. The model-room and dining-room are separated from main hall, with broad openings provided with columns and Ionic caps, giving the whole an attractive appearance immediately upon entering. This dining-room has a paneled wainscoting eight feet in height, and massive ceiling beams. The buffet built in is handsomely treated, and the open fireplace has a brick hearth and facings, and a mantel rising to ceiling, with overmantel in panels. The cafe and billiard-room are treated in a most artistic manner. The walls have paneled wainscoting, above which the walls are tinted in a dull green, while the ceilings are beamed. The arch-way with columns between the two apartments is most effective. The fireplaces have brick facings and hearth, and neat wood mantels. The kitchen and its dependencies are isolated from the main building by being located in an extension, and are fitted up complete in their various appointments. The second and third floors contain thirty-two sleeping-rooms, ample toilet-rooms, and baths. The extension over the kitchen apartments contain the men and women servant dormitories and bedrooms, with private stairways to first floor. Mr. Frank T. Cornell, architect, No. 281 Fourth Avenue, New York city.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A CHURCH AT SAN FRANCISCO, CAL.

THE engravings on pages 21 and 24 illustrate the Second Church of the New Jerusalem (Swedenborgian), situated on the corner of Washington and Lyon Streets, San Francisco, Cal. The design was one of the last perfected by the late A. Page Brown, previous to his untimely death. The design is an adaptation of the "Mission" style, of which there are many fine exemplifications in California, and is one of the larger and more complete, in miniature. It is but fair to state that in the preparation of these plans the architect was greatly indebted to the Rev. Joseph Worcester, the pastor of the church. The lot upon which the church is built is 102 x 58 feet in dimensions. It is on a slope, looking south, and rising from the corner. A high bank was left in grading the street, and necessitating a high concrete bulkhead so as to bring the level of the lot up to the highest part and allowing an entrance directly from the street. If a church of large dimensions had been required, it would have been necessary to have the length of the building coincide with the length of the lot, leaving only a narrow strip of ground (never a thing of beauty) surrounding the church. But, fortunately, the congregation was not large, and the width of the lot gave ample room for the length of a building required, and an open porch on the street as well, leaving an area nearly square, open to the southern sun and prospect, and sheltered from the prevailing winds by the rear extension. The end of the church being upon the street permitted direct access to the interior, but other considerations influenced a contrary arrangement. The street end was in the east and by preference the proper position of the chancel, and, besides, there seemed a real advantage in the way of quiet and retirement in having the entrance at the further end approached through the garden. The walls of the church are a mingling of concrete and hard-burned brick. The roof is covered with heavy Spanish tiles. The interior walls are partly covered with an unadorned wainscoting of Oregon pine, and on the north side, opposite, the windows are panels with large mural landscapes representing the early and later rains and the times of harvest. Excepting one circular window in the east gable, all the others are on the south side, of plain rectangular leaded glass, about 7 x 4 feet in size and three in number. The central panel of the middle window contains an artistic representation of St. Christopher crossing the river. The roof is divided into panels by heavy timbering, and supported by branches of the Madrono, clothed in native bark. The seats are chairs of maple frame and rush, designed by the architect. The flooring is of Oregon pine. The auditorium is about 50 x 30 feet in size, and the height to the ridge 18 feet. The acoustic properties are absolutely perfect, and the seating capacity one hundred. The cost was $7,500, and the lot about the same.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODEL COTTAGE AT STONEHAM, MASS.

THE engravings on page 33 show a model cottage house erected for Mr. Edward Buxton, at Stoneham, Mass. The design is not very elaborate, simplicity being one of its attractions, while its plan is arranged in a most convenient manner. The underpinning is constructed of deep cherry red brick laid in red mortar. The exterior is clapboarded to the belt, which extends around the building at the height of the top of the window architraves of first story, and is shingled above. It is painted a Pompeian red below, and Cabot's creosote stain to match above the belt; the trimmings and sashes are Colonial cream. The gutters are a V wood gutter set on wrought iron brackets away from the house, thus preventing backing up of water. The roof is shingled. Dimensions: Front, 28 ft.; side, 37 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 9 ft., second, 8 ft. 4 in.; third, 7 ft. 9 in. The interior is finished off in an artistic manner. The hall is finished in oak, treated in the Old English style, with paper to correspond with its very dark color. The vestibule, with coat closet, has a very heavy Japanese paper. The hall also contains a nook with seat, and a very handsome staircase, turned out with newel posts and balusters. The parlor opens from the hall and is finished in white enamel. Opening from both hall and parlor is the dining-room, finished in very light oak. The walls are hung with dark-green ingrain paper, with a deep bronze Egyptian border. The fireplace in this dining-room has a hearth and facings of tile, and a mantel of oak. The kitchen and its dependencies are trimmed and wainscoted with North Carolina pine, and it has an entry-way, coat closet, and space for refrigerator. The second floor is trimmed throughout with whitewood; two rooms being finished natural, and two painted. This floor contains four chambers, with closets, linen closets, and bath-room, the latter wainscoted in hard plaster, lined off and enameled, and furnished with porcelain fixtures and exposed plumbing. The third floor contains two bedrooms and ample storage room. A cemented cellar contains furnace, laundry, cold closet, vegetable cellar, etc. Cost, $4,500, complete. Mr. E. R. B. Chapman, of Rand & Chapman, No. 6 Beacon Street, Boston, Mass., was the architect.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

PLAN OF THE SECOND AND THIRD FLOORS.

A MODERN COLONIAL RESIDENCE AT NEW NETHERLANDS PARK, WHITE PLAINS, N. Y.

We present on pages 28 and 29 a modern Colonial residence erected for Willard H. Baker, Esq., at New Netherlands Park, White Plains, N. Y. The design is admirable and has many excellent features on the exterior. The plans are most complete. The spacious piazza and porte-cochère, the balconies, and bay windows are among the attractive exterior features. The underpinning is built of rock-faced bluestone. The superstructure is covered on the exterior with shingles and left to finish natural, while the trimmings are painted bottle green. The roof is covered with shingles and stained a moss green. Dimensions: Front, 60 ft.; side, 36 ft., not including piazza. Height of ceilings: Cellar, 7 ft. 6 in.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The grand hall is the most attractive apartment in the building. It is trimmed with oak, and has massive ceiling beams and paneled wainscotings. It is separated from parlor and library by archways and columns. The broad fireplace, built of field stone, laid up at random, is an excellent feature, and is capped with a massive stone shelf. The staircase, separated from main hall, in harmony with the openings at library, is treated in a unique manner, and is located upon a broad platform, containing a nook with paneled seat and arch beneath stairway; while the stairs, with ornamental newel posts and balusters, wind around and up to second and third floors. The remainder of the house is trimmed with cypress. The parlor is treated in white enamel, and the library in natural wood. Both are separated by an archway with columns, and each has open fireplaces furnished with tiled facings, hearth, and mantels to correspond with trim. The last has bookcases and a paneled seat built in. The dining-room is an attractive room, with bay window and seat thrown out, and an open fireplace, with tile trimmings and mantel. The kitchen and its apartments are fitted up most completely in every respect. The second floor contains a large open hall, five bedrooms, with large closets and two bathrooms. The fireplaces where shown have tiled facings and mantel. The bathrooms are wainscoted and paved with tiles, and are provided with porcelain fixtures and exposed plumbing. The third floor contains three bedrooms and trunk-room, besides ample storage room. A cemented cellar contains furnace room and other necessary apartments. Mr. William A. Lambert, architect, No. 99 Nassau Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

Removal of the Reservoir.

The actual work of tearing down the old reservoir for the New York Library, at Fifth Avenue and Fortieth and Forty-second Streets, was begun on June 7. The débris in the interior of the reservoir, which has not been used for some time, will be first removed, and the destruction of the walls will soon begin. There are 110,000 cubic yards of stonework to be removed. The contractor will receive $105,000 for the removal of the stonework, and the remainder of the $378,000 which the contractor is to receive will be for the construction of the foundation for the new Library.

A MODERN DWELLING AT "FOREST PARK HEIGHTS," SPRINGFIELD, MASS.

The engravings shown on page 31 in this issue illustrate a modern dwelling which has been erected for the Forest Park Heights Land Company, at Springfield, Mass. The design is well executed, and it has many excellent features both on the exterior and interior. The piazza, with Colonial columns, the balcony, and gambrel roof are all good features. The underpinning is built of brick laid up in red mortar. The superstructure is covered with sheathing, paper, and then clapboards and shingles. The clapboards are painted Colonial yellow, with white trimmings, while the shingles are stained a Van Dyke brown, of a soft deep tone. The roof is covered with shingles. Dimensions. Front, 33 ft. 6 in.; side, 33 ft. 6 in., not including piazza and porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior arrangement is most excellent. The hall and the remainder of the interior is trimmed with white pine, some of which is treated in ivory white, while the remainder is treated in tints of two colors and natural finish with hard oil. The hall contains an ornamental staircase, with newel posts, balusters, and rail turned out of similar wood in a handsome manner. The library is an attractive apartment. It contains an open fireplace, furnished with a tiled hearth and facings, and a mantel of special design, and also paneled seats and bookcases built in on either side of same. The parlor and dining-room are separated from each other by double sliding doors, and are well lighted and ventilated. The former is treated with white enamel. The butler's pantry is finished natural, and is fitted up complete with cupboards, dressers, closets, etc. The kitchen is wainscoted and finished similar, and is furnished complete. The lobby is provided with a large closet to accommodate ice box and stores. The second floor contains four bedrooms, sewing-room and bathroom, the latter wainscoted and furnished with the best modern porcelain fixtures and exposed nickelplated plumbing. The third floor contains three bedrooms and ample storage room. A cemented cellar contains furnace, laundry, and other necessary apartments. Messrs. Louis Frank Newman & Carroll H. Pratt, architects, No. 21 Elm Street, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

THE TAYLOR MEMORIAL LIBRARY AT MILFORD, CONN.

The engravings shown on page 32 in this issue illustrate the Taylor Memorial Library, at Milford, Conn., erected by the late Henry A. Taylor in memory of his wife, Mary Taylor. The building is a very attractive one, and is in harmony with its surroundings and in keeping with the purpose for which it is intended. It is treated in the Romanesque style of architecture, and one of the features of the exterior is the great circular arch, with voussoirs of dressed stone four feet six inches in length. The building is constructed of rough field stones and brick laid up at random, some of the stones weighing two tons each. These stones are varied in color, and are in harmony with the buff Roman brick and red sandstone trimmings. The roof is covered with red tiles and cresting. The gates at the entrance, and the gas lamps at each side, in the design of a griffin, with a light suspended from its mouth, of wrought iron, are unique features of the entrance-way. The interior arrangement is excellent. The entrance-way has a floor laid in mosaic tile, while the walls are built of stone and brick, same as exterior walls. The ceiling is beamed, forming deep panels. The interior is trimmed with quartered oak and provided with quartered oak floors. The entrance leads to a main central hall, containing an ornamental staircase, with a lavatory under same conveniently fitted up with the usual fixtures. To the left of entrance is the reading-room, containing the usual furniture of oak, and of a solid and handsome design, and it also contains a large open fireplace with mantel, built of stone and brick, over which there is a memorial tablet placed in chimney-breast. To the right of the entrance is the book-room, containing ample bookshelves and all the appurtenances for a well-regulated library. The rooms have paneled wainscotings and a ceiling dome shaped. The windows are glazed with leaded glass, in delicate hues. The second floor contains one large room for the meeting of the board of trustees, besides ample room for storage. A cemented cellar contains a gas plant and steam heating apparatus. Mr. Joseph W. Northrop, architect, Main and Bank Streets, Bridgeport, Conn.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

Chemistry as an Aid in Building.

When the dark halo of mystery which surrounded the mediæval alchemists gradually dissolved under the influence of the flickering rays of a new light, and the weird and secret operations which our fathers performed in their vain search for the philosopher's stone and the elixir of life became superseded by less fantastic but more useful experiments to discover, by open and systematic research, the nature and properties of the most familiar forms of matter, then was laid the true foundation of that chemical science to which the present generation is so greatly indebted.

Since the expanding force of our teeming centers of civilization is irresistible, and Nature's scenic beauty is being thrust ever farther and farther from our homes, architecture in its highest form must daily become of greater national importance as the most powerful reactive agent against the depressing and demoralizing influence of "speculative builder" architecture, a type of modern architecture which, in spite of its dreary monotony, is, unfortunately, extensively adopted in our great metropolis.

That base surroundings tend to create ignoble minds is a generally admitted fact, and it is evident, therefore, that the general beauty or repulsiveness of a town is a matter of vital importance to its whole community. In most British towns, the architectural standard of business and municipal premises has risen during the last quarter of a century in a very encouraging manner, but these same towns still harbor their poorest denizens in quarters which, in their appalling sordidness, are apt to quench the final sparks of human nobleness, whilst they nurture the more fortunate thousands in streets of buildings remarkable only for lack of originality in design.

A noble edifice is one of the most valuable legacies that man can leave to future generations, yet the grandest product of the designer's hand and brain may be rendered of but passing value through inattention to those practical details of construction with which chemistry is concerned. Had more attention been given to the chemical effect of the atmosphere of London upon the stone actually employed in building the Houses of Parliament, it is probable that only the most durable stone from the quarry would have been used; the strenuous efforts of expert men of science to devise or select a satisfactory process for preserving the imposing pile from premature decay would have been unnecessary, and the valuable Report of the Royal Commissioners on the selection of stone would have produced a more satisfactory result.

The "weathering" or stones is, however, but one of the great number of subjects connected with building with which chemistry is intimately associated. "Dry rot" and "wet rot" in timber, the corrosion of metals, the "setting" of cements, the drying of oil paints and varnishes, the discoloration of certain pigments, and the effects of air and water upon quicklime are all, more or less, the results of chemical reaction. Combustion, moreover, is essentially a chemical process, yet it is the main factor to be considered in designing heating and ventilating arrangements.

Artificial building materials, particularly those of a fireproof character, are becoming every year more extensively employed; the production of many of these is dependent upon comparatively recent chemical discoveries, and many owe their commercial success to a large extent to the extraordinary reduction in the price of chemical products which has taken place during the last twenty years. Fireproof coverings for walls and ceilings, and timber made fireproof by chemical treatment, are rapidly increasing in popular favor, while artificial stone has long been a valuable article of commerce. It is too early yet to attempt to ascribe their true permanent value to many of these materials, but the increasing rate of their production is an indication that chemical science is likely to be applied more extensively in the future for the manufacture of building materials than it has been in past years; and, as man's scientific knowledge becomes more advanced, it is possible that very radical changes may be made in the size, shape and composition of the materials employed in the erection of buildings. Already we have witnessed the common adoption of iron for girders and other purposes, and, although brick and stone are unsurpassed as building materials for permanent structures, there is a growing tendency in the construction of business premises and dwellings to sacrifice durability for lessened cost and increased speed of erection; and the diminishing power or will of the average builder's operative to perform satisfactory work is likely to result in an increased use of those artificial products which can rapidly be applied by the square yard by any unskilled lad.

One cannot but feel some regret that the world now moves so fast that the business premises of the father are incapable of being adapted to the requirements of the son; with the result that many strong and interesting buildings are razed to the ground to make way for others more suited to the business necessities of the age. Some three months ago it was announced in the Builder that the old Post Office—that massive building on the east side of St. Martin's-le-Grand—is to be pulled down to make way for a new building better suited for the present business of the Post Office. Yet this classic edifice was built as recently as 1825–1829. If, however, we accept the inevitable, and recognize that the cities of the future will be largely composed of buildings of more soul-inspiring design and more imposing dimensions, but of less massive and durable construction than were the cities of the past, it becomes evident that materials made by the aid of chemistry and the kindred sciences will be in great demand during the next century. But while we foresee a general advance in the architectural standard of the average erection of the future, a question which must remain unanswered is: Will the noblest erections of the future advance beyond the best of those which have come down to us from the past?

In conclusion, mention must be made of one other subject with which chemistry is concerned, and which has not hitherto received sufficient attention from builders in general, viz., the adulteration of building materials. If samples were collected and examined of all the building materials on sale in London at the present time, some surprising results would be obtained. Linseed oil is largely adulterated with mineral and resin oils, fish oil, and cotton-seed oil. White lead frequently consists mainly of barium sulphate or of chalk, but sulphate of lime and sulphate of lead also enter occasionally into its composition, while a certain amount of clay has also been disposed of under this appellation.

Vast quantities of barium sulphate are also sold in the form of paint, but mostly under fancy names at fancy prices. Colored pigments are notoriously the subject of gross adulteration, and "turps" and methylated spirit are not always above suspicion. A sample of cement or mortar taken from the works and subjected to analysis will oft result in strange revelations, while analyses of metal fittings are not always uninteresting.

But enough has been written to demonstrate that a knowledge of chemistry may be of considerable practical value to the builder and practicing architect, and that the influence of chemical science upon building will probably increase appreciably in the immediate future. Chemistry must, of course, always hold a secondary place in the studies of the architectural student; but an elementary knowledge of its laws, and a little practical acquaintance with the common elements and their com-

pounds, is undoubtedly desirable; and contractors would often be obliged to build with better-class materials if architects more frequently seized samples for chemical analysis.—The Builder.

Workingmen's Houses in Germany.

VICE-CONSUL J. F. MONAGHAN writes from Chemnitz, saying that there is a movement on foot to furnish workingmen with better tenements. Now they are crowded into buildings which often look like barracks. The proposed houses will be built on lots about 16½ feet wide by 102 feet deep, thereby allowing for a front yard for flowers and a back yard for a vegetable garden and shed, the latter for the keeping of poultry or some domestic animal. The houses will contain five rooms. A parlor and kitchen will be on the first floor, the parlor containing a porcelain stove and heating pipes, and the kitchen a wash boiler and stove. The three bedrooms on the second floor will easily hold five or six persons, and can be made to accommodate ten. In the largest an iron stove will be placed. A pump will provide water where the city water-works do not extend to the house. In connection with the shed is a water-closet. The cost of such a house and lot, when a number are built at a time, will between $850 and $940. It will rent for about $53 a year—that is, for the same price the workingman has to pay for two rooms in the barrack-like tenements of the large cities.

Plants for Shady Spots and Lawns.

ON many grounds the space that can be devoted to plants is frequently so located that little sun reaches it, and unless the proper selection is made it will be almost impossible to obtain satisfactory results. Naturally, if the soil is moist, ferns will do better in shaded locations than most other plants, but there are numerous varieties of hardy perennials, some of them blooming, that will do for such situations, increasing in beauty each year. Chief among these are the herbaceous pæonias, the only requisite for profuse blooming being a rich soil. If this can be furnished, the plants will grow sturdily and the blossoms will be of good size. Most of the best varieties are exceedingly fragrant, while the range of color is as wide as with roses. Pæonias are especially attractive when planted with some dark foliage shrub as a background. Set directly in front of a hedge of California privet, the effect is magnificent. For a plant of creeping habit in a shady situation the well known myrtle (vinca minor) is especially valuable. It is a strong grower, the foliage a pretty green, and the blossoms blue. The partridge berry, of evergreen foliage and creeping habit, bearing small flowers followed by crimson berries, and the bishop's cap, bearing spikes of white flowers, are both desirable for shady spots and are entirely hardy.

The family of so-called soft plants, most of them greenhouse products, also furnishes several classes well suited to the shady spot. These are not hardy, however, and will need to be taken up in the fall. Many of them can be used in the window garden or conservatory during the winter. The alocasia illustris is one of this class. The foliage is large, dark green, with a velvety blue-black cloud suffusing it, and is especially attractive in the open ground when grown near the fancy-leaved caladiums. The latter are becoming more popular as the planters understand that they require shade. Given this, with a light but rich soil, the colors of the foliage are most beautiful. According to variety the foliage is marked and mottled, often with several shades. Some are of solid color with a blush of brighter color suffusing the surface, others have the mid-rib distinctly and strikingly marked, while still others have a decided border of contrasting color around the outer edge. These caladiums alone would make a shady corner one of the most attractive places on the grounds.

Another difficult problem that confronts the owner of grounds where large trees are growing, or where there is considerable shrubbery, is the bare spots, partly owing to shade and partly because the tree absorbs much of the plant food in the soil. The deep-rooting grasses generally used for lawns will not thrive. Such spots can be concealed to a certain extent when under shrubbery of an upright habit by planting flowering plants near them, but placing them so that they will have an abundance of air and plenty of rich soil. Under trees the case is different, and one must rely for vegetation here upon some of the hardy perennials of a creeping habit. They will establish themselves readily and grow without especial care. Some of them are flowering, which adds to their effectiveness.

Hydrophyllum canadense, which grows about a foot high and blooms in June and July, is well suited for the purpose if it can have a little sun. The plants grow rapidly, and in a single season will cover a large space with a mass of attractive foliage. They do particularly well in damp spots. The aconitum, or monk's hood, is one of the best for bare spots, but its use is not advised where there are children, for the roots or tubers are poisonous, and children are apt to eat them. The favorite anemone, or wind flower, is very desirable for positions under shade trees, particularly the varieties "snow-drop" and "Pennsylvania," both bearing white blossoms in profusion. Lysimachia nummularia, or money wort, bearing deep yellow blossoms from June to August, with a dense foliage of creeping habit, will cover bare spots under trees quickly, and is one of the best plants for the purpose. It is hardy, and will thrive in any common soil.

Where ground available for culture is limited, and where the space is largely taken up by the lawn, much dependence for plant decoration must be placed on such as can be grown in tubs or pots, and yet be sufficiently robust to stand the changes of weather outdoors during summer. All of the following plants are suited for out door culture, either by plunging the pot or tub in the soil, which will give the impression that the plant is growing in the open ground, or by simply grouping them artistically on the surface of the ground. Some of them, like the crotons, can be set directly in the open ground in beds, where the growth will be stronger and the foliage markings much brighter.

The popular lily of the Nile (agapanthus umbellatus) is a splendid ornamental plant for either lawn or veranda, or it may be grown in the conservatory during the winter. The foliage is attractive, but the chief beauty lies in the bright blue blossoms, which are borne on long stalks, and remain perfect for a long time. The aspidistras, so popular as winter decorative plants, are fine for lawn decoration. The variety lurida variegata has broad, tropical-like foliage of green, attractively striped with white. The crotons are of the kinds that do best set in the open ground. There are ten or a dozen varieties, with magnificent foliage markings. Crotons do best where they can have full sunlight and plenty of moisture to bring out the rich beauty of the foliage. A few of the best sorts are youngli, the leaves of which are long, dark green, and irregularly spotted with yellow and red; a glorious plant when set in full sunlight. Veitchii has bright green foliage, mottled with yellow and crimson. The foliage of dayspring is orange yellow, edged with green and tinged with red. Interruption has peculiarly twisted foliage, with a crimson mid-rib.

The broad leaf dracænas are suitable for lawn decoration when grown in pots. The variety fragrans has broad, deep green foliage of a solid color, and lindeni green foliage, with yellow stripes on the edge, in charming contrast to fragrans. Among palms the phœnix canariensis, belonging to the family of date palms, has dark green, feathery foliage, and because of its vigorous growth and ability to stand sun, rain or wind without damage is the one palm for outdoor use in summer. The musa ensete, or Abyssinian banana, is perhaps the most tropical-like of all plants used outdoors. It grows to a height of eight or ten feet, the leaves being long and broad, the color of the foliage green, with crimson mid-rib. It will grow in any ordinary garden soil if it has full sunlight. A selection from among the plants named would add beauty to a lawn that would be scarcely possible with any other growth.

Among summer flowering bulbs the gladiolus family is superior to all others, when ease of culture, beauty of foliage and blossom, freedom from insects and disease, and profuseness of bloom are considered. The varieties are strikingly marked and colored, grow freely in ordinary garden soil, and are useful for bedding, for borders, and in mixture with other blooming plants. The bulbs may be started indoors in pots and transferred to the open ground in May. The plant is a late summer bloomer, but the season is easily prolonged by setting the first bulbs in boxes or pots as recommended, and making plantings in the open ground at intervals of two weeks until the middle of June. By this plan the bulbs started indoors will bloom early, followed by the others, so that blossoms may be had until frost. The soil should be fairly rich, and, if light and sandy and the bulbs are of good size, they should be planted ten inches or a foot deep. If the soil is heavy or the bulbs small, three or four inches deep will be sufficient, although the deeper the bulbs can be planted with good results, the less will be the need of staking the plants when they reach maturity.

Those who are familiar only with the old-fashioned garden variety of gladiolus can hardly appreciate the beauty of the more improved sorts of the giant and Lemoine types. The varieties of the giant family furnish blossoms of large size and exquisite markings. In good soil the blossoms are frequently eight inches or more across and are borne in great profusion. So exquisite are the markings on the blossoms of most varieties that they are frequently termed "summer orchids." The following description of two of the best varieties of this class will give the reader an idea of the brilliancy of coloring to be found among the varieties of the giant gladiolus: Burlington, bright pink, tinged with orange scarlet, with a white throat mottled with carmine. Splendor, soft rose color stained with magenta, and the throat mottled with purple and white.

The Lemoines, better known as butterfly gladiolus, are not so tall in habit of growth as the other classes, nor are they so profuse bloomers, but the blossoms are beautifully marked, usually on the lower petals, the upper petals being of solid color. This class is especially desirable on small grounds where taller growing plants are not desirable. A fairly rich soil, plenty of moisture during the growing and blooming season, and a sunny location are all required to grow gladiolus to perfection.

Whether the plants grown in the window garden are those obtained in the spring for the purpose, or those that have done duty previous winters, they require care during the summer to fit them for bloom next winter. Such plants as vinca, passiflora, plumbago, abutilon, calla lilies, ivies, heliotrope, and geraniums commonly grown in the window, should be taken from the pots, with the ball of earth adhering to the roots, and set in the open ground, in fairly good soil, and in a partially shaded situation. Some of them will shed their foliage under this treatment, but new leaves will come later, and the plant will be in the best possible condition to take up and repot in the fall, ready for a winter of bloom.

Lantana, vallota, abelia, monthly roses, euonymus and the like should be left in the pots and be plunged in the open ground in a position where they will get considerable sun; while ferns, aspidistras, rubber trees, palms, etc., should also be plunged with the pots, but be set in a shady location. In plunging the pots, dig a hole the depth of the pot or a little more, placing in it a small inverted flower-pot or a flat stone to prevent the roots growing through the hole in the large pot into the soil. Sink the pot in the hole to a level with the surrounding surface. Water should be given the plants in pots in sufficient quantities to keep them in good condition, but not enough to encourage a strong growth until late summer, when it may be furnished freely. Then the plants may have every incentive to grow sturdily and steadily preparatory to potting in fresh soil and removing to the window or conservatory.

Where a low stone wall marks the dividing line between properties, or where there is a wide expanse of blank or dead wall at the rear of the house, some effort should be made to at least partially cover it with vines. For the dead wall of a building where it is not advisable to use a trellis, the Boston ivy (ampelopsis veitchii) is the only vine of merit that may be used to advantage, as it is the only one that grows to a considerable height without requiring any other support than that given by the wall. The small tendrils of this vine cling firmly to the rough surface of the wall, and require no training except away from windows or other openings. The foliage is a delicate green, darker in the older growth, and changing to various shades of bright color in the fall.

For walls or fences low enough for the vine to need no support other than the structure itself, and for higher walls in front of which a trellis can be placed, any of the hardy climbing vines will answer, although the favorites are the clematis paniculata, with its mass of white flowers and delicate foliage; C. crispa, with fragrant purple blossoms, and C. coccinea, which grows rapidly and bears bell-shaped blossoms of scarlet in great profusion all summer.

Since the advent of the crimson rambler, that variety is taking the place of all other roses for training against walls or over a trellis. It grows to a height of fifteen feet or more, and belongs to the polyantha class, resembling the dwarf members of the family in its masses of clusters of miniature roses. The trusses are large, and there are frequently fifty perfect roses in each cluster. It is one of the most profuse bloomers among roses, and the blossoms are pure crimson, rich and vivid. The plant is entirely hardy throughout the country and will give perfect satisfaction anywhere. If desired, the crimson rambler may be trained to a pillar by setting a heavy post in the open ground and training the growing shoots around it. In a single season it will cover a post eight feet high with a mass of beautiful foliage and brilliant blossoms.

As a rule the use of evergreens, especially on grounds of moderate dimensions, should be confined to the more dwarf classes and those of peculiarly formed or highly colored foliage. The classes growing to a considerable height cast such dense shade that bare spots are always found around their base, and as they are gross feeders all vegetation near them suffers to a considerable degree. One thing in favor of evergreens, particularly in cold sections, is their cheery aspect during the winter, when all other trees are bare of foliage. Evergreens do best in a fairly rich, well-drained soil, and are not difficult to grow if properly planted. The roots should never be allowed to get dry at the time of planting, nor at any time until after the trees have become well established. Plant from the middle of April to the first of June, or in August or September. At these periods all coniferous evergreens may be safely transplanted, while the result will be doubtful if the trees are set at any other time. At the time of planting give plenty of water, press the soil firmly among and over the roots, permit no manure to come in contact with the roots, and for the first summer keep a heavy mulch of straw, hay or leaves on the soil for a distance of three feet all around the tree to conserve the moisture in the soil.

As the dwarf sorts only are recommended for general planting on grounds of small or medium size, only such are here mentioned. Cypress (obtusa nana) grows only to a height of four feet, and has intensely dark shell-like leaves, differing in form from any other tree of the family. It is a most desirable variety for planting on the lawn. The golden Chinese juniper is in direct contrast

to the preceding both in form and color of foliage. It is one of the best of the dwarf yellow foliage evergreens for general planting, and, when grown with the variegated variety—juniperus sinensis variegata—with its dense bluish-green foliage interspersed with silvery white, is a decided attraction on the lawn. Douglas' golden juniper is especially valuable for grouping, as it grows only two feet high, forming a perfect net of spreading foliage of brilliant golden color. The Siberian arbor vitæ, while growing to a height of eight feet. is so valuable that it deserves mention and a place even on small grounds. The foliage is bluish green and dense, in charming contrast to the golden variety of juniper named. Of the spruce family, picea excelsa pumila is the most desirable dwarf sort, not growing over three or four feet high, but having all the beauty of foliage of the taller sorts. Although the list here given is small, the varieties are choice, and are hardy as far north as lower Wisconsin. They may be planted with perfect confidence that the result will be entirely satisfactory.—Brooklyn Eagle.

The Architectural Superintendent.

THE following notes on the duties of an architectural superintendent were written by Mr. Edwin B. Clarke for the Technograph, an annual published at the University of Illinois. The duties of an inspector of buildings cannot be learned by reading, no matter how good the articles may be, yet such advice as that given by Mr. Clarke will doubtless prove of service even to those members of an architectural office who are not engaged in superintendence. What he says about explicit directions and completely figured plans deserves special attention.

The art of superintending is not only the art of fault finding, but the art of fault remedying and fault preventing. If building operations were not attended by mistakes, misinterpretations, and disagreements, it is evident there would be no need for the genus superintendent; hence, it is with the difficulties that beset him, and their remedies, that this article will chiefly concern itself.

The faulty plan is the first source of annoyance. Frequently a set of drawings is so hastily finished that omissions and inaccuracies are almost unavoidable. Contradictions and discrepancies occur between the general drawing, scale, and full size details, and the specifications, resulting not only in annoyance and controversy, but also in no little expense and delay if not discovered before the ordering of material, or the performance of that part of the work affected by them. It should be the superintendent's first care to make a thorough examination of all plans and details, comparing them with the specifications, and with each other, in order that all errors may be discovered and eliminated before the work is begun. This examination will also aid in fixing in the mind the peculiarities which differentiate the new work from others with which he has previously been connected.

The plans furnished the contractors should be complete. The drawings should be provided in sufficient number to thoroughly cover the work, and show plainly how it is to be done, so nothing will be left to the imagination of the builder. Mr. Clarke strongly favors numerous sectional drawings, which shall clearly show any unusual or special features or finish, and a sufficiency of dimensions to permit the execution of the work with the fewest possible arithmetical calculations by the workmen at the building.

Draughtsmen are usually reluctant to bind themselves by figures on a drawing, but unless the workmen are mind readers—and few of them are—it is hardly to be expected they will properly carry out the artist's idea when he himself declines to define it. In figuring dimensions, it is of advantage to give, where possible, a string of distances between centers of main features, with subordinate lines of dimension for the separate parts of those features, and also to note on each plan the bays or dormers which are to center with some other feature of the building, above or below them. This method will materially decrease the liability of the builder to make mistakes in laying out his work, and an error when made may be quickly found and easily rectified without affecting more than a single feature. It will also be found useful to adopt a "building" line (usually the line of the first story above the water table) as a base line from which to figure dimensions, as well on the basement and foundation plans as on the first floor plan. This building line may be shown by a red or black dotted line on the drawings.

The value of explanatory notes on drawings should not be underestimated, and the more of them there are, even though they are repetitions of items covered by the specifications, the better. The plans may be called common property, since they are used by all the craftsmen alike, while the specifications, if accessible, are usually so divided that each foreman refers only to the particular section covering his special work, and is ignorant of its relation to that of the other trades. In such cases it is evident that proper co-operation is improbable, if not impossible.

The repetition of the common lines of height on all elevations and vertical sections is to be recommended. It is quite a convenience to the superintendent, and saves mistakes arising from the builder's inclination to trust to memory rather than to turn to the plan on which the heights occur. It may be said that the contractor should be made to suffer for his own negligence, but it must be remembered that the drawings are really implements or tools, as necessary for the prosecution of the work as the trowel, saw or hammer, and it is the duty of the architect to furnish them to the builder in as perfect a state as possible, if the final results are to be satisfactory.

Any improvements tending to convenience in handling will amply repay any extra time consumed in preparing them in the draughting room, and a day or two, or in unusual cases even a week, devoted to figuring and checking up dimensions on the working plans, will avoid expensive mistakes and time wasting delays, with the resulting disputes and controversies, and at the same time will give the plans a definiteness that will enable the estimator to make a closer proposal for the work before the contract is awarded. For the same reason it is desirable to fully indicate, by framing plans or diagrams, the kind and size of materials to be used, and the methods to be employed.

It is a decided advantage to the superintendent if he has been employed in the production of the plans whose execution he is to supervise. His familiarity with the drawings will enable him to see more readily the effect that a change at one point will have on others of the work, and will be especially valuable to him when it is necessary to give an order without a chance for study or leisurely consideration.

The superintendent should secure a complete set of all drawings to be used in the work, including general plan, scale, and full size details and diagrams, outside of the sets furnished the contractors. He should also have his own copy of the specifications, and all agreements and contracts to which to refer in case of dispute between contractors concerning the scope of their respective contracts. The above applies only to the superintendent in charge of large work not in the same city with the architect, who cannot, therefore, have access to the office sets.

The first duty of the superintendent on the ground is to check up the dimensions and laying out of the building. For this a steel tape should preferably be used, and, for a long series of measurements, the ring end held at a single point while the different required dimensions are marked off in order along the length of the tape from a memorandum slip previously prepared. This prevents accumulative errors, which, with the average mason, reaches four or five inches in the hundred feet before it is considered worth noticing. In order to keep the work in hand, the superintendent should require that he shall have approved all work laid out before building is proceeded with. To measure the width of footing trenches, a stick cut to the width of the footing, with a notch for the building line, will be found convenient. A plumb line dropped from the building line stretched above will pass the notch, and show at once if the trench is properly located and of the required size. With several different widths of footings, and for places where no line can be stretched in the excavation itself, this method should save much time and many mistakes.

If the plans show no chases or slots for soil and waste pipes, or gas, water, and electric mains, the superintendent should arrange with the mason to build them in the proper places as the walls go up. Neglect to consider this frequently leads to unsightly results, such as a group of pipes cutting through a handsome cornice, or spoiling the appearance of an otherwise attractive room. The location of the horizontal pipes should also be considered; whether in the floor, that is, between the joists, or cut in over them; under the floor; hung to the ceiling below and exposed to sight; or under a raised floor; also, whether the marble or other wainscoting back of toilet-room fixtures can set flat against the wall, or must be moved far enough forward to allow the waste, supply, and vent pipes to run behind it.

The note-book should be the superintendent's constant companion, not only for jotting down ordinary items to jog the memory for the daily details of the work, but to be used as well to preserve a record of orders to and agreements with contractors, instructions to foremen, and alterations or changes sanctioned in plans or specifications. In fact, the entries should include everything relating to the building which may possibly be needed for future reference. Especially should dates of orders, and delivery of plans and details (if no record is kept in the office) be noted down, in case it becomes necessary to refer to them in settlement of claims for enforced delay in completing a time contract.

The superintendent should notice, from time to time, if all the workmen who can be advantageously employed are on the different branches of the work. He should inquire concerning the ordering of material, and the progress of the work of the sub-contractors, in order that no delay be caused by their failure to come to time. More time is thus lost than from all other causes together.

The superintendent should see that application is made for detail drawings in such season that they will be on hand before needed for use.

It is a good plan to occasionally visit the mills, foundry, pattern, and modeling shops, to inspect the work in progress, and explain to the workmen points that are vague or misunderstood, before it is too late.

One should not be above accepting advice from contractor or workman, for fear of loss of prestige, since frequently their experience suggests methods or facts. either of merit in themselves or expedient under existing circumstances. Neither should one be so complaisant as to adopt these suggestions without careful consideration. If they are rejected, it should be done so as to leave no doubt about it in the mind of the workman, nor as to the method actually to be employed. Frequently it is necessary to say to the builder: "Your way must be just as good, but the specifications prescribe a method which I know will give results satisfactory to the architect, and, as I am answerable to him after your responsibility in connection with the work ceases, I must require you to follow the specified directions." Material or work condemned should be ordered removed at once. It is a common trick among foremen to agree to see to that later, with the expectation that the matter will slip the superintendent's mind until the defective material or work can be hidden or covered up.

Structural iron is usually required to have several coats of paint after delivery. In order to insure its receiving the required number of coats, and proper care in their application, and also to prevent a delay for painting and drying when the material is wanted for use, it is well to insist that this work be done as soon as the metal is on the ground.

The superintendent himself should cultivate the following characteristics: Tact, force, decision, and gentlemanliness. He will be called upon to listen to endless complaints of interference by one contractor's men with the work of the others, and is expected to arbitrate them. He will be referred to as a walking specification by foremen who find it more convenient to question him than to take the trouble to look up requirements themselves. This he should be encouraged to do. Some foremen ignore the specifications entirely, depending on the superintendent to assume responsibility for anything opposed to them, which he has failed to discover, but "which it is his duty to find out," as Mr. Clarke was once informed by a foreman. The same brilliant fellow was one day very much put out with me, because his attention had not been called to a note on one of the plans. He had shored up a 17-inch brick wall and cut an opening in it in the first story, before he discovered that it should have been torn out above also, to make way for a stud partition to take its place. Of course the single I beam, which the note called for, while ample to support a stud partition, would hardly do the same service for a 17-inch brick wall. Another nuisance is the man who always knows a better way to do everything than the way he is called on to do it (simply for the sake of change), and who is positively unhappy if his suggestions are unheeded. Of course, the superintendent ought never to lose his temper. He may lose his patience, and express his opinions, but he should let the other fellow put himself at a disadvantage by getting mad. As a general rule, however, flattery builds quicker than friction, and the greater the superintendent's skill in overcoming difficulties, expediting work, and settling differences, the better superintendent he is.—Engineering Record.

New Uses of Glass.

EARLY in October, 1898, a paving company of Lyons, France, began laying on the Rue de la République a piece of pavement of ceramo-crystal, ceramic stone, or devitrified glass. During the months of November and December of 1898 and thus far in January, 1899, this pavement has been driven over during all hours of the day and night. It has stood as hard usage as any pavement could be subjected to during that time, and is still in an admirable state of preservation. The glass, or ceramic stone, pavement is laid in the form of blocks, 8 inches square, each block containing sixteen parts in the form of checkers. These blocks are so closely fitted together that water cannot pass between them, and the whole pavement looks like one large checkerboard. Like all thoroughfares in France, the roadbed slopes gently to the walk on each side. Some of the edges of the checkers have been broken off during their three months' service. United States Consul Covert counted some twenty of them that have been slightly chipped on the edges. It is contended that this does not argue against the value of the material as a pavement, and that any kind of stone would have suffered just as much or more in the same time.

Mr Covert visited the Ceramo-Crystal Manufacturing Company's works at the suburban village of Demi-Lune, about six miles from Lyons. The factories cover nearly 8,000 square yards of ground. Work is now stopped in them while additions are being made to the buildings in the shape of second stories. In the yards are many tons of broken bottles, which the superintendent told me was their "raw material" On the four sides of a large brick smokestack are specimens of ceramo-crystal for buildings

and interior decoration, some of the pieces as smooth as highly polished marble, others being rough, like cut stone, and still others having a surface like common brick.

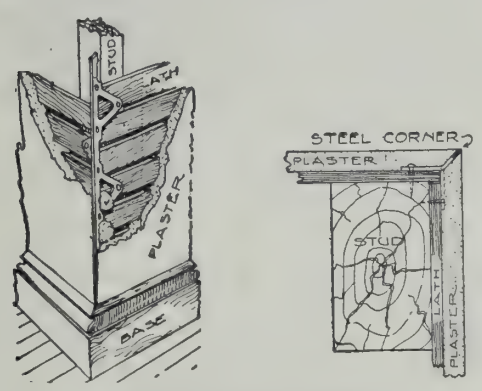
The advantages attributed to this ceramo-crystal by the manufacturers are: As a pavement, it has a greater resistance than stone; it is a poor conductor of heat, and ice will not form upon it readily; dirt will not accumulate upon it as easily as upon stone, and it will not retain microbes; it is more durable than stone and just as cheap. The Central Architectural Society of France made a report recently on this ceramic stone.

This subject is being discussed in the press and is receiving general consideration. An elaborate and exhaustive article in the Revue des Deux Mondes for November treated the question under the heading of "A Glass House," the writer asserting that a large house constructed entirely of glass would be an attractive feature of the coming World's Exposition in 1900. He said that glass could be used for tubes, pipes, vats, tiles, smokestacks for factories, and for buildings. Double glass walls in a house would admit of the circulation between them of cold or warm air, thus regulating the temperature.

The glass house, or the luminous palace, which it has been decided to build on the grounds of the 1900 Exposition, is now being constructed.

WOOD'S STEEL CORNER.

WOOD'S steel corner is a patented device, which is nailed to a lath and is embedded in the plaster of projecting corners to prevent their chipping. The corner is usually the weakest part of a wal'; but by means of the device in question it can be made the strongest part. The device straddles the corner, makes



WOOD'S STEEL CORNER.

a complete union of the connecting surfaces, and produces a perfectly straight, substantial corner, which can be ornamented without moving the decoration or wrinkling the paper.

The corner can be used with wood, brick, or fireproof construction, and can be adapted to the greatest variety of work. It overcomes the need of using the heavy, objectionable wooden bead, and adds to the fireproof qualities of a building. The corner is made by Gara, McGinley & Co., 21 South Seventeenth Street, Philadelphia, Pa.

The Electricity Building at the Paris Exposition.

THE building which will be devoted to the electrical exhibits of the Paris Exposition will be a most remarkable structure. It is so florid and ornate that it resembles no other building ever constructed. It will undoubtedly be the most striking building which is seen on entering the grounds. The façade has a richly ornamented portico, and directly in the middle is an enormous fountain which masks three-quarters of the central part of the façade. It is what is known as a "Château d'Eaux," and consists of a deep niche, with steps at various levels over which water will flow, and a group of sculpture will terminate it. The building will be made of staff, and will be brilliantly treated in color.

A Memorial to Sir Thomas Browne.

IT is proposed to erect, at an estimated cost of about $5,000, a statue to the author of "Religio Medici" and "Hydriataphia" (or "Urn Burial") in Norwich, where he practiced as a physician during forty-six years, having removed thither from Shipden Hall, near Halifax, in 1636. A suggested site for the statue is the Haymarket, being near the site of his house, now used as banking premises, and distinguished by a memorial tablet. Sir Thomas Browne was buried in the church of St. Peter Mancroft, where his remains were discovered some years ago on the digging of a grave in the chancel.—The Builder.

FROM the J. W. Bailey & Sons Company, of 14 Charlestown Street, Boston, Mass., we have received an excellently printed and illustrated catalogue, entitled "Effective Interiors," in which the wood mantels made by the company are described verbally and pictorially. A copy of the catalogue will be sent to any of our readers on application.

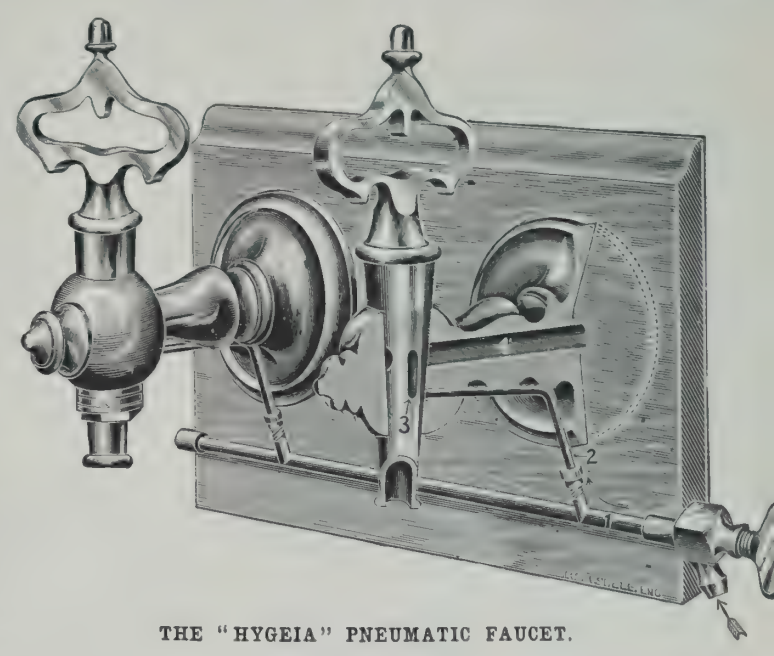
THE "HYGEIA" PNEUMATIC FAUCET.

THE "Hygeia" pneumatic faucet is the outcome of much study and numerous experiments on the part of the inventor, and a general demand from the dispensers of ale, beer, and other liquids under pressure, for a faucet that would effect a saving in the great waste of these liquids which necessarily takes place, from the fact that ale or beer standing in pipes over night becomes stale. The result is that the liquid which the pipes contain must be thrown away before a fresh, pure draft can be obtained from the barrel. By the use of the "Hygeia," the ale or beer can be returned to the cask at night, or at pleasure. No extra force or room is required. The same pressure that forces the liquids up to the faucets will, by the mechanism of the "Hygeia," allow it to return to the barrel, so that the first draft drawn in the morning is as clear, pure, and cool as any drawn during the day.

The cut annexed represents a full and sectional view of the "Hygeia" pneumatic faucet, with its attachments. The numeral 1 represents the main air-tube, which supplies the several smaller tubes and cocks, and receives its supply of air from the air-pipe, the air-tube being connected with the air-pipe at some convenient point by means of a small rubber tube, one end of which is attached to the valve at the right, indicated by the arrow-head, the other to a nipple screwed into the air-pipe below. 2 represents individual air-tubes connecting the main air-tube with the plug in cock. 3 represents a hallow groove in the plug, which conveys the air from the tube 2 to the groove 4, or the beer channel. 4 represents the channel or core through the main body of cock. When the flow of liquid is shut off, the groove 3 communicates with tube 2 and channel 4, allowing the air to come up into the cock, thereby equalizing the pressure; and the liquid seeks its level in the barrel. The "Hygeia" faucet is manufactured by Hygeia Manufacturing Company, Palmyra, N. Y.

Foreshortening in Reliefs.

AMATEUR judges often pronounce erroneously on the merits of "alti" or "bassi rilievi" from not being acquainted with a very essential principle which should prevail in works of the kind. There should be no foreshortening of the limbs in relief, and there should be no attempt, by diminishing the size of objects, to give the effect of distance. Exceptions may be found, but the ancients, who are the best masters of all that relates to the practical in sculpture, seem to have made this a general rule. Sculpture professes to represent "form," and can only represent by form. Foreshortening form must make it monstrous. To represent an arm extended, with the fingers pointed directly in front of the spectator, in "basso-rilievo," the tips of the fingers must be made to spring from the shoulder; for, for want of space the intervening portions of the limb, viz., the hand, wrist and arm, could not be represented. The ancient sculptors seem to have acted so entirely on the principle here laid down that they scarcely ever attempted to represent a front face in "basso-relievo." The same principle precludes the representation of distance or of remote objects It is not possible to give the effect of distance or space when the color remains the same on all objects and is equally bright in all parts of the work. Sculpture is to give form in "fact." Painting has only to give it in "appearance." The attempts to overcome these difficulties by the sculptors of the seventeenth and eighteenth centuries, though ingenious, could not be referred to as good specimens of sculpture. They are many of them admirable for qualities of design; but they are fully as much, or more, painters' as sculptors' compositions.—The Architect.



THE "HYGEIA" PNEUMATIC FAUCET.

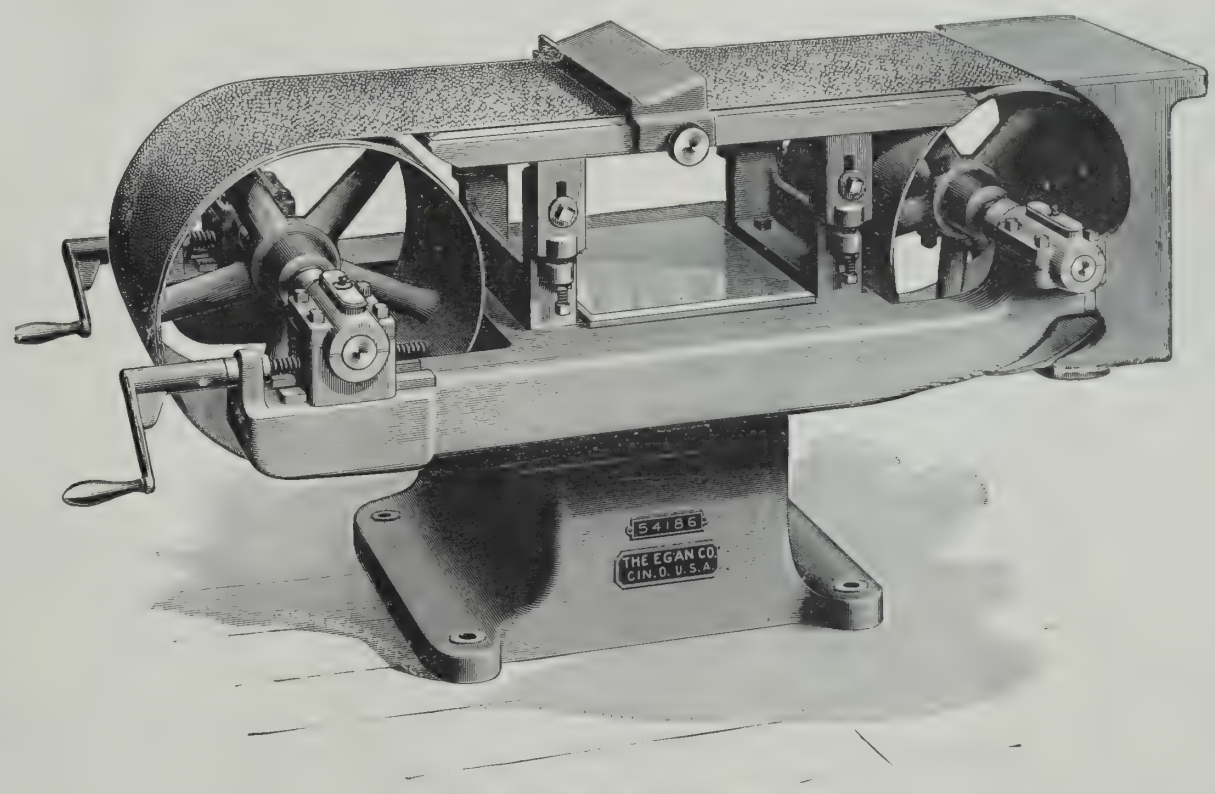
A NEW TYPE OF SAND BELT MACHINE.

A new machine is being made by the Egan Co., 209-229 West Front Street, Cincinnati, Ohio, for cabinet-makers, box-factories, desk-manufacturers, planing-mills, and all classes of wood-working establishments. It will be found a wonderful labor-saver. For sand-papering all flat surfaces, and especially such irregular or framed work as may not be readily fed through the triple drum sanders, rounding of corners, etc., it will prove invaluable.

It works with great rapidity, as the sand-paper is presented to the full surface of the piece, polishing the entire surface accurately in the least possible time. The belt, passing over an iron table planed to a true surface, makes possible the most accurate results. Every square inch of paper is used.

The machine is built of iron and steel throughout, the main frame being cast in one piece, cored out, and provided with substantial base. It can be run at high velocity without the slightest vibration,

The table is 14 inches wide, planed to a true surface, with vertical adjustments to retain alinement, and fitted with an adjustable fence, which may be set in any position desired. The table at the extreme end of the machine is flush with the sanding surface of the belt, giving the machine advantages over the ordinary hand-feed sander. This table is also adjustable for lining-up.



A NEW SAND BELT MACHINE.

The drums are of large diameter, so designed that the belts can be instantly changed. The drums are adjustable, so that the belt may be given proper tension. A suitable hood is provided for pipe connection to remove the dust. The hood is hinged, so that it may be readily swung around out of the way to facilitate changing belts.

THE "CORBIN" LOCK.

One of the most radical departures in the making of door-locks is to be found in the Corbin lock, made by Messrs. P. and F. Corbin, of New Britain, Conn. In Fig. 1 we have presented a perspective view of a front-door lock, showing the locking collar on the knob, swinging latch, and dead bolt with the thumb-knob. The principles involved in the construction are also well

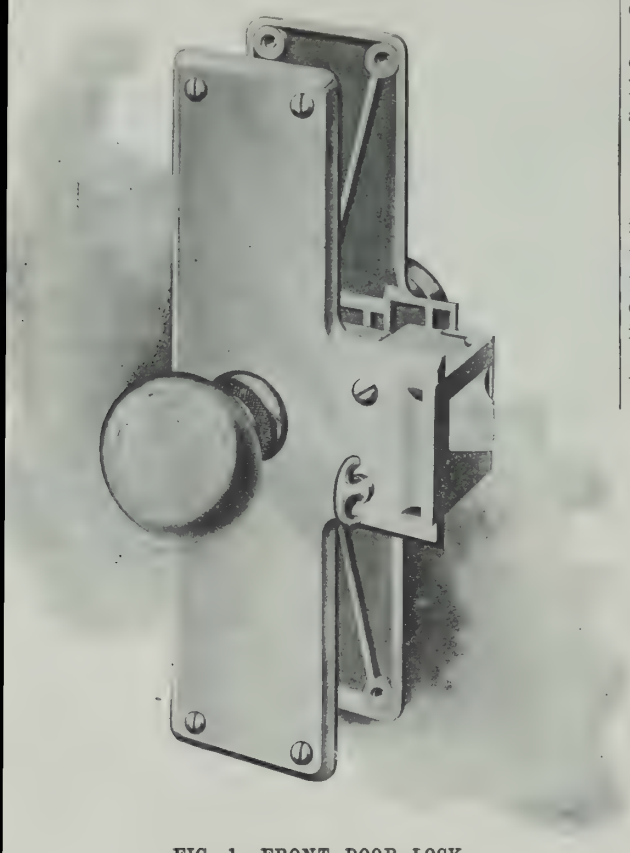


FIG. 1.—FRONT DOOR LOCK.

shown in Fig. 2, representing a top view of an office lock with its casing removed. The two rollbacks shown in the center perform a double function: they operate the latch and lock the door when manipulated by the collar on the inside knob. To lock the door it is necessary only to give the collar on the inside a quarter turn, throwing the rollback nearest the outside into the slot shown, thus rendering the outer door immovable. The latch can still be operated by the inside knob and the other rollback, or from the outside by means of a key, engaging the rollback by means of the locking spindle through the knob shafts. The front-door lock has a dead bolt in addition to the latch, attached to a thumb-knob, instead of the dead-locking device shown.

The communicating lock has upon each side a thumb-stop like that shown in the illustration, so that the occupants of adjoining rooms can lock the door against intruders. A closet lock has merely the latch mechanism, with only a knob on the outside. A ship-lock has a key-action on each side, without the locking ring.

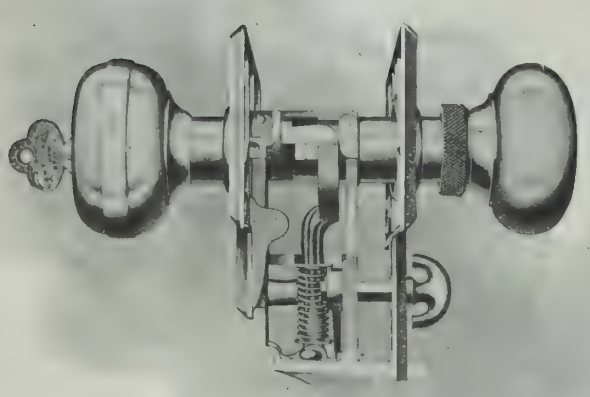


FIG. 2.—OFFICE DOOR LOCK WITH JACKET REMOVED, LOOKING FROM ABOVE.

Not the least commendable feature of the construction is the ease with which the lock may be attached. It is necessary merely to saw from the stile of the door a piece three inches deep by one and one-half inches in width, to slide the lock, which has been already assembled by the makers, into the cut, to tighten the machine screw which clamps the escutcheon against the side of the door, and to drive home four screws into each escutcheon. A boy who can make a straight cut with a saw can apply a Corbin lock as well as any skilled carpenter.

What a mechanic would probably most admire in the Corbin lock is the very close adjustment of parts possible, and the manner in which the mechanism is firmly held in the same relative position in a frame made in one solid piece. Indeed, so closely are the gages set that the play of the knobs in the frame is restricted to a maximum of 0.002 inch. There is hence gained an ease and evenness of action, a firmness and solidity to the touch, found elsewhere only in the better class of safe and vault locks.

The placing of the key work in the knob is a radical departure, by which is secured additional room for the latch mechanism, greater strength of frame, and an adjustment of parts which always remains the same.

Gas Piping.

There is a certain amount of moisture in all illuminating and fuel gas, which, when exposed to severe cold, will condense. To take care of this condensation all gas pipes must be properly drained to some point where it can be removed conveniently. In dwellings, so far as is possible, all pipes should drain towards the meter, where the drip water can be removed when necessary. Where draining to the meter is not practicable, a "drip" should be placed easy of access. Care must be taken not to permit a "trap" being formed by a sag in a long line of pipe, or where a fitter is compelled to run a line of pipe around some object. It requires very little condensation to obstruct or retard the flow of gas, and is sure to make itself manifest in cold weather when gas is most needed.

The following are the maximum lengths of pipe for a given size supplying a given number of lights:

Size of Pipe.	Greatest Length Allowed.	Greatest No. of Burners.
⅜ inch	26 feet	3
½ "	30 "	6
¾ "	50 "	20
1 "	70 "	35
1¼ "	100 "	50
1½ "	150 "	100
2 "	200 "	200

If the above table were strictly adhered to and the pipes properly drained, there would be very few complaints from want of gas.

DISTRIBUTION OF LIGHTS.

It is a good plan, when building a house, to have plenty of openings. It is not necessary to use all. In the center of all living-rooms there should be an outlet, notwithstanding that the use of side brackets in preference to chandeliers is very common at present. The reason for center lights is that light is better distributed from the center of the room when only one or two lights are desired, and furthermore, the light is above the line of vision and not a glare in the eyes. However, bracket lights are very essential in every home. In dining rooms, it is often desired to use side lights and a banquet lamp on the table. This makes a very pretty effect. A bracket light placed in a convenient place in the living-room or library is very convenient, as it often does away with the drop lights or table lamp. A den with a bracket light for service with an oriental lantern in the center of the room for ornament makes a very nice combination.

Bathrooms should always be equipped with the bracket light. Chambers should have two bracket lights, one on either side of the dresser. My reason for bracket lights in bathrooms is that a small gas heater can be attached more conveniently from the wall than from the ceiling. This applies also to other rooms. In chambers, brackets are convenient for attaching numerous gas appliances in the shape of curling irons and small heaters.

Gas pipe outlets are usually left too long, and especially so where the building is wired for electricity and a sliding canopy is used to cover the insulating joint. If the outlet extends as much as three inches, it is necessary to cut it off to make neat work. Three-quarters of an inch, no more and no less, is right for either chandelier or bracket. At this time when so many fancy brackets are used, short outlets are an absolute necessity.

Architects and builders should insist on having gas pipe outlets straight and uniform in length, and not to exceed one inch from plastering. It is a custom among irresponsible fitters to make a general use of what is commonly called a "bent drop," that is, simply bending the end of the pipe for an outlet. Bent outlets are rarely straight and never uniform in length. This method saves considerable time for the fitter, but frequently wastes much time for the man hanging the fixtures. Bent outlets should not be permitted in nice work. In straightening such outlets the pipe is frequently split and much trouble is sure to result. The proper method is to use elbows and nipples instead. All outlets should be securely fastened. The gas company requires that the risers shall be extended to within eighteen inches of the meter.

In estimating the cost of gas piping, where measurements are not known, a safe method for good work is to allow $1.50 per room for a new building, and $2 per room in an old building.—Wilber L. Burgess, in Kansas City Architect and Builder.

Composition for Preserving Furniture.

Take small pieces of wax, white or yellow, and add oil of turpentine until the solution has the consistency of a thick paste. Of this mixture lay a piece as large as a bean upon a piece of cloth, and rub it out as much as possible on the piece of furniture. Then wipe with a woolen rag.

By this process the gloss is restored to walnut furniture, to marble, to varnished metal, etc. But if this composition is to be used on articles which have a red color, the

FIG. 3.—SAWING THE CUT FOR THE LOCK.

oil of turpentine must be colored before adding the wax, by soaking some alkanet in it until the oil turns a deep violet. If the gloss is to be restored to mahogany, the oil must be dyed only slightly, because this wood has a tendency to become brown in time; bird cherry wood, however, bleaches in the course of time, hence for this the oil must be strongly colored.

It is well to use of this mixture only a piece of the size of a bean at a time. If more is taken, it is necessary to rub a longer time. Hence, it is better to put on a second thin layer and to repeat the operation several times. This requires more time, but is less tiring and gives a better gloss. After rubbing with the woolen rag, it is well to finish rubbing with an old linen one.—V. H. Soxhlet, in Neueste Erfindungen und Erfahrungen.

Gilding of Glass or Porcelain.

To gild glass or porcelain, instead of the ordinary mixture, a solution of gold chloride in oil of turpentine or lavender oil, to which a little bismuth nitrate and chrome soap have been added, is employed. The following mixture is said to give good results: Lavender oil, 900 grammes; gold chloride, 100 grammes; bismuth subnitrate, 5 grammes; chrome soap, 50 grammes. After the application allow the mass to dry, and bake the articles in the muffle furnace. The gilt portions show a nice gloss, without any subsequent treatment.—Neueste Erfindungen und Erfahrungen.

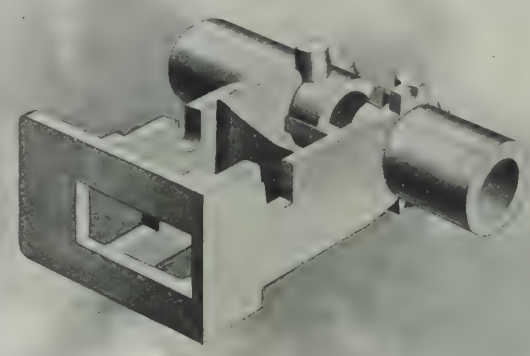


FIG. 4.—SOLID FRAME PIECE.

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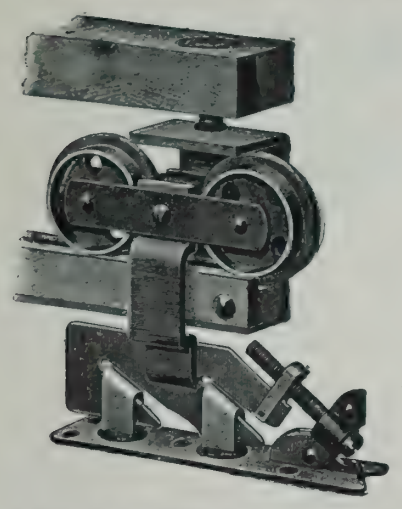

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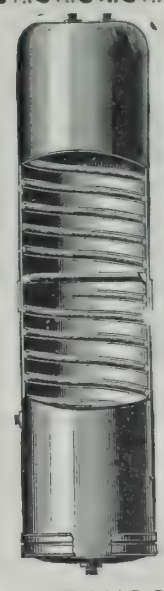

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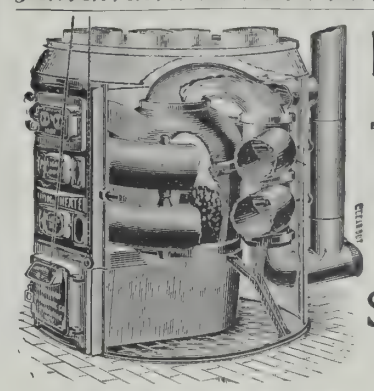

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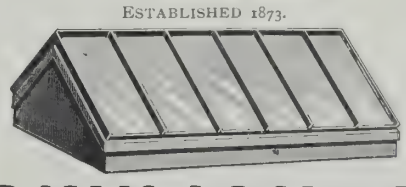

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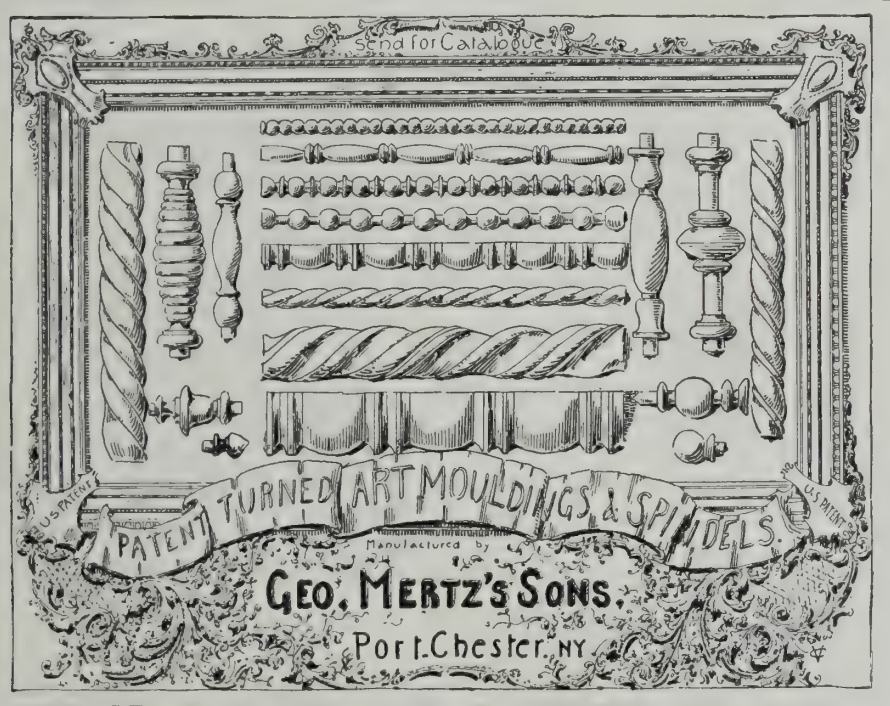

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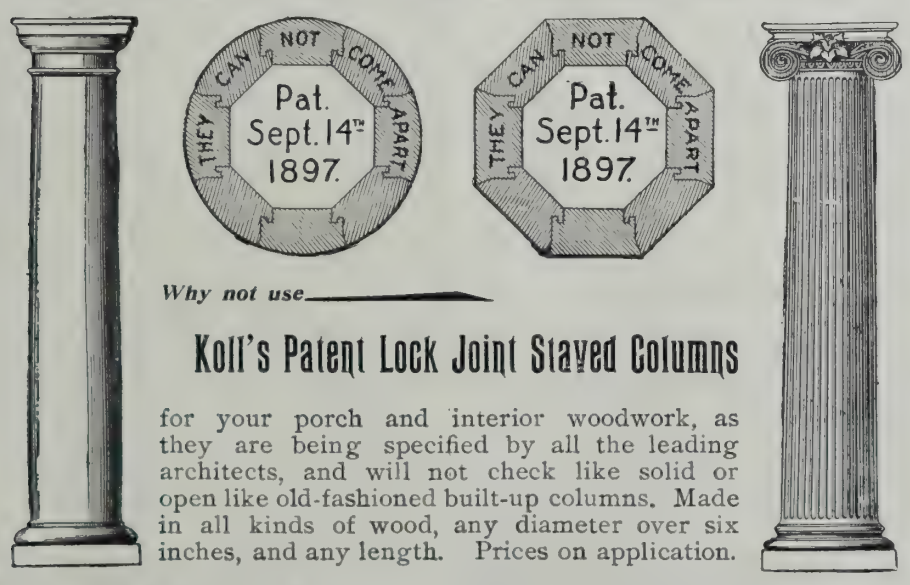

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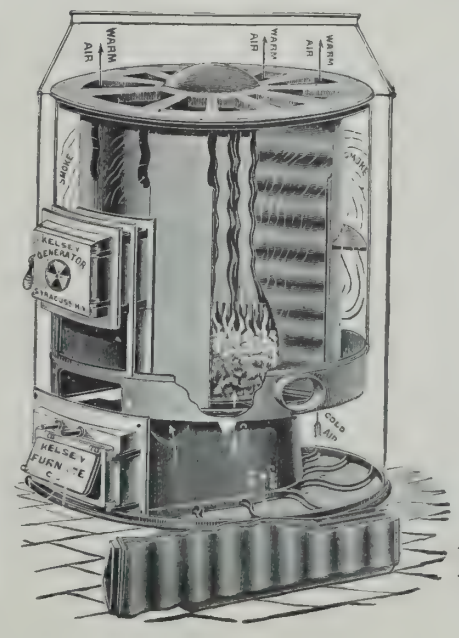

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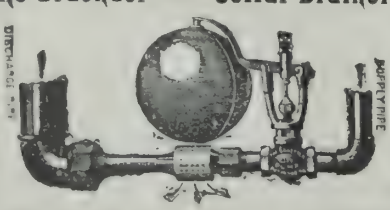

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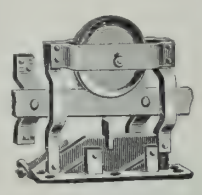

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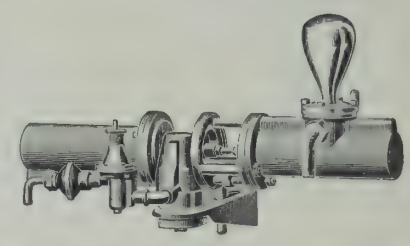

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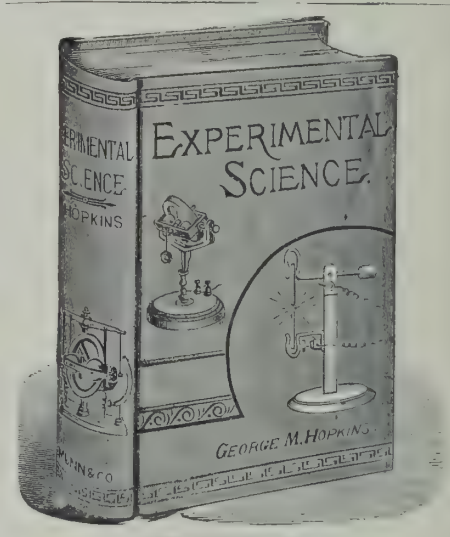

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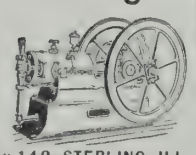

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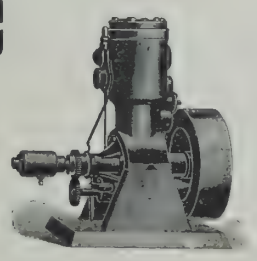

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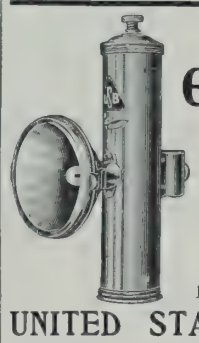

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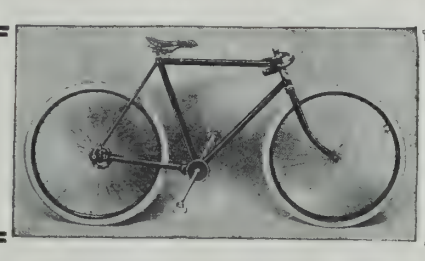

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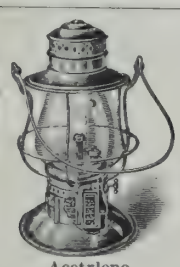

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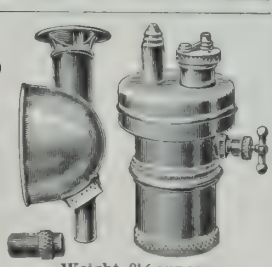

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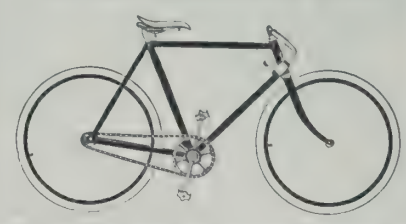

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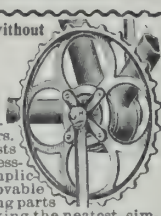

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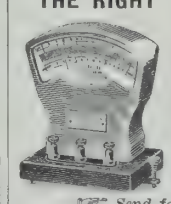

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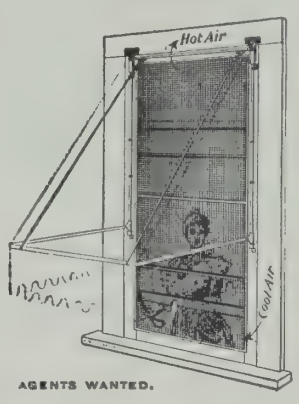

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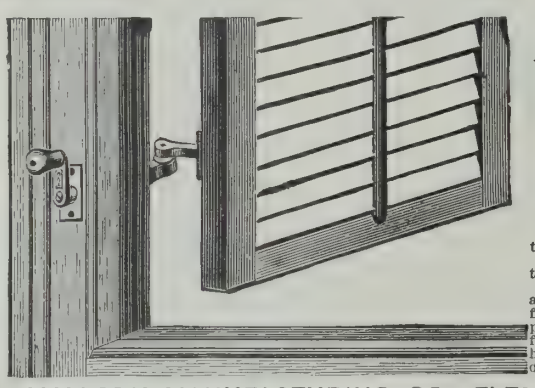

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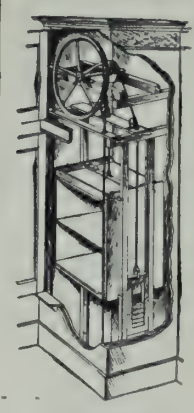

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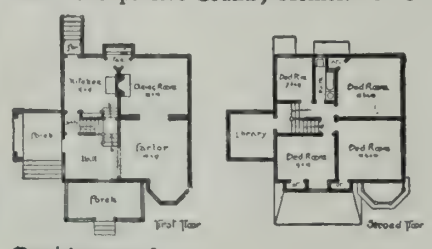

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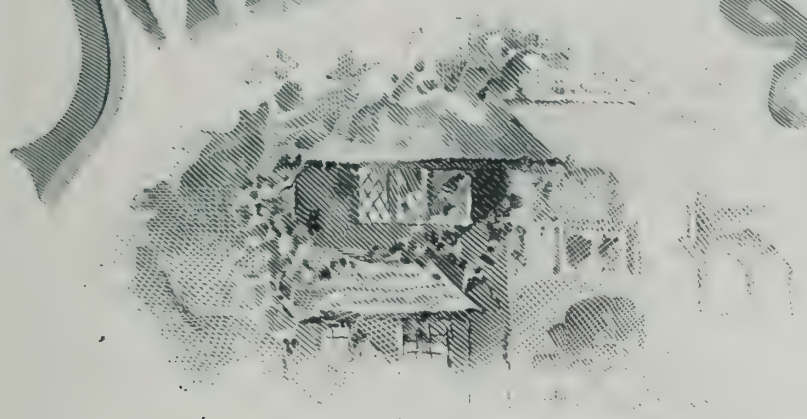

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INTERIOR VIEW OF HALL—A RESIDENCE AT BELLE HAVEN, CONN.—See page 42.

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SKELETON CONSTRUCTION COMMEMORATION.

ON August 9 a memorable event took place in the architectural world. This was the placing of a bronze tablet on the outside of the Tower Building, 54 Broadway, New York, the commemoration of the building of the earliest example of the "skeleton" construction. The tablet which was placed on the outside of the building bears the following inscription: "This tablet, placed in 1899, by the Society of Architectural Iron Manufacturers of New York, commemorates the erection, during 1888–9, in this, the Tower Building, of the earliest example of the skeleton construction, in which the entire weight of the walls and floors is borne and transmitted to the foundation by a framework of metallic posts and beams."

The invention of the "skeleton" construction is much disputed, and we believe that Chicago claims the invention as her own. We are not surprised that the tablet should have caused great discussion. New York to-day affords the largest and finest examples of such construction. The essential features of the "skeleton" have often been used, but on September 17, 1888, Bradford L. Gilbert, architect, filed plans with the Building Department of New York for the Tower Building, a structure 129 feet high, and having a frontage of only 21 feet 6 inches. The side walls were to be constructed in a peculiar manner. Instead of ordinary solid brick walls, vertical lines of columns were placed at varying distances up to about eighteen feet apart, having at the foot of each line a shoe resting on the foundation walls at the basement level. The wind pressure was provided for by diagonal bracing carried across between each of the vertical columns, and so constructed as to transfer to the foundation a wind pressure of seventy miles an hour. The building laws at the time did not provide for such a construction, and before a permit to build was given it was referred to the Board of Examiners in the Building Department, and soon after its construction was authorized. Then other architects followed, and improvements were rapid. Buildings of greater area and greater height followed, until we have such enormous structures as the Manhattan Life Building, seventeen stories high, with a height of 242 feet to the main level of the roof; the American Surety Building, twenty-one stories, 312 feet high; and the Park Row Syndicate Building, with a total height of 386 feet to the top of the towers. Nowadays buildings of any great size are constructed on the "skeleton" principle, and the limit of height does not appear to have been reached as yet.

Until 1870, elevators had not been used to any great extent for passenger service, but about this time buildings of considerable height began to be erected, and people lost their prejudice against the upper stories of the taller buildings of the time. With the elevators at that period eight and ten stories seem to be about the limit to which it was considered advantageous to go, because the enormously thick walls took away from the rentable space in the lower stories, and the cost of the foundation was too great. At first the new method was called the "steel cage," and later the word "skeleton" was used, but the terms are not exactly synonymous ones. By "skeleton" construction, we are to understand the framework of the iron or steel columns and girders to carry the weight of the outer inclosing brick walls, together with the floors and the weights which they are to carry, including the live weight of persons who conduct their business in the buildings. The older "cage" construction called for only a support of the floors and the partition walls, but in the "skeleton" construction, the outer walls are in panels, which panels extend horizontally from column to column, and vertically from girder to girder, so that they are really curtain walls and sustain nothing, their weight being borne by the girder. It will be seen that by this construction the walls can be made of much less thickness, which is of prime importance where the value of real estate is so enormous as it is in New York, than where they have to bear the weight of the floors as in the ordinary building. It is nothing unusual in New York to see a building run up eight, ten, or even twelve stories, before a particle of the wall is laid, and there is one building which is now being constructed in which the walls begin at the second story, leaving a gap of twenty or thirty feet to be filled in at a subsequent stage of the building operations, and such work is being constantly carried on.

The "skeleton" method of construction never fails to impress foreign architects, and Herr Paul Wallot, the celebrated German architect who built the German Parliament Building at Berlin, and who is now in this country as a juror in the international competition for designs for the new State University of California, says: "From a technical standpoint your tall buildings, or skyscrapers, are extraordinary achievements, and, I must confess, inspire me with a high respect for the skill and daring of my American colleagues. . . . The view of New York Harbor, and the magnificent light in which it was presented to me, is unrivaled, and will be a memory which can never be extinguished." The view of the city as the steamer approaches closer to the city cannot fail to impress every one with a sense of power, and shows the great mastery which our architects and engineers have over inert materials. The lofty buildings nearly all resemble towers at that distance, and one might almost think that we had again returned to the days when Italian cities could boast of their three hundred towers.

A MODEL HOUSE AT SOUTH ORANGE, N. J.

WE present as a subject for our illustration, on page 48, in this issue, a model house which has been erected for Mr. H. T. Underhill, at South Orange, N. J. The design was selected from a number submitted in competition for a prize offered for the best design for a suburban house. The elevations are clean-cut, ornamented sufficiently to give them an artistic appearance, and are combined with a most excellent and complete interior arrangement. The underpinning is built of rock-faced bluestone. The superstructure, of wood, is covered with narrow clapboards, with the butts neatly joined at angles. The whole is painted a light pearl gray, while the trimmings are painted a cream white. The roof is covered with shingles and is left to weather finish. Dimensions: Front, 38 ft.; side, 43 ft. 4 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The entrance being at side, it necessitates the placing of the hall in that part of house, which is less important than the front of the house, which is usually occupied by the hall. The hall is trimmed with oak, and has a paneled wainscoting and ceiling beams. The fireplace, built of brick, has a hearth and facings to ceiling of glazed tiling, and a mantel shelf. The staircase, of oak, is turned out in an ornamental manner. There is a paneled seat at side of staircase. The music-room is trimmed with whitewood, and is treated in ivory white. The library is trimmed with mahogany, and is furnished with paneled seats and bookcases built in. The fireplace is built of brick, with hearth and facings of tiles and mantel of mahogany. The dining-room is trimmed with whitewood and finished natural. The china closet is furnished with latticed glass doors. The fireplace has a tiled hearth and facings and mantel. The door and window casings on the first floor are handsomely carved. The kitchen and pantries are trimmed with whitewood treated natural, and are fitted up with the best modern fixtures complete. The second floor is trimmed with whitewood, and contains a large open hall, four bedrooms, large closets, and a bathroom; the last is wainscoted, painted enamel white, and fitted up with porcelain fixtures and exposed plumbing. The third floor contains servant rooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, about $9,000 complete. Mr. J. H. Cook and Mr. Fisher Miller, of New York, were associated as architects in the designing of the building.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT BELLE HAVEN, CONN.

WE present herewith, on pages 41, 50, and 51, in this issue, a modern country residence, which has been erected for E. W. Russell, Esq., at Belle Haven, Conn. The exterior of the house is a modified and modernized adaptation of the Colonial style, combined with the Early Dutch tower and the English gables, treated in the half-timbered style, the whole being specially adapted to the American climatic conditions. The roof lines are particularly harmonious and graceful. The main architectural features are the gables, tower, overhanging roof, balconies, and the spacious piazza. One of the unique features of this house is the terrace, which forms a part of the piazza. Terraces, underpinning, and part of first story are constructed of rock-faced stone of a bluish gray color. The remainder of the building is constructed of wood, with the exterior framework covered with shingles and stained a russet brown color. The window-casings are painted cream white and the beamed gables a dark brown color. The building is roof-shingled and stained a dark green color. Dimensions: Front, 78 ft.; side, 50 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 11 ft.; second, 9 ft.; third, 8 ft. 6 in. The design for a house has been to leave out all unnecessary barriers, such as hallways, every part to be livable. The main hall is used as a living-room. The Old English baronial period lends its character to this room. The room is trimmed with dark antique oak, and has a paneled wainscoting and a massive beamed and ribbed ceiling. Out of this hall a broad staircase springs, which, in an unbroken range, extends to the main building, from which the stairs divide, leading up in either direction to the second floor. This staircase has massive newel posts delicately carved, and balusters turned out in a handsome manner. The fireplace in the hall is furnished with terra-vitra hearths and facings and a massive carved mantel. A bay window is thrown out with paneled seats. The reception-room is treated in the Colonial style, with old ivory white, and has a bay-window rising up two steps and provided with seats. The library is trimmed with dark oak, and is provided with a beamed ceiling and paneled wainscoting, and with bookcases built in. The fireplace is furnished with terra-vitra hearth and facings, and mantel in harmony with the remainder of the apartment. The billiard-room is placed two risers above the level of the first floor. It is trimmed with dark antique oak, and is separated from the hall in an artistic manner. A double archway is formed by a post rising to ceiling, at one side of which the steps to the billiard-room are placed, while at the other side the space is devoted to a paneled seat. The fireplace is furnished with unglazed facings and hearth and mantel. The dining-room is treated in the Old English style, and is trimmed with Old English oak. It has a paneled wainscoting rising up to within eighteen inches of ceiling and capped with a dish shelf. The ceiling is ribbed, forming panels. The most attractive feature of this room is the nook, containing an open fireplace, with hearth and facings of unglazed Dutch tile-brick, with wrought iron trimmings, and a mantel shelf supported upon ornamental iron brackets. The butler's pantry, rear hall, and closets are fitted up in a most convenient manner complete. The second and third stories are treated in china white. The second floor contains a large open hall, five bedrooms, dressing-room, and two bathrooms, the last wainscoted with porcelain tile, paved with unglazed tile, and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains several bedrooms, servants' rooms, and bath and ample storage room. The basement contains the kitchen and its apartments, servants' dining-room, laundry, and a cemented cellar with furnace. Mr. Charles P. H. Gilbert, architect, 1123 Broadway, New York city, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT HOLYOKE, MASS.

WE present herewith on page 45 a modern residence which has been erected for A. L. Green, Esq., at Holyoke, Mass. The design is treated in the modern Colonial style, with gambrel roof and Colonial detail, and it has many excellent features, including its cobble work, bay windows, and porches. The underpinning is built of rough field stone laid up at random. The superstructure is covered on the exterior framework with sheathing paper, and clapboards, and painted a deep red, brilliant in tone of coloring, with cream white trimmings. The blinds are painted bottle green. The roof is covered with shingles and stained in harmony with the body of the building. Dimensions: Front, 36 ft.; side, 60 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The interior arrangement is most excellent. The entrance is through a vestibule, trimmed and paneled with light quartered oak, and furnished with tile floor. The main hall is trimmed with light quartered oak, and has a beamed ceiling and paneled wainscoting; it also contains an open fireplace trimmed with tiled facings and hearth, and a mantel of oak with massive columns and mirror. The staircase has a paneled seat, and a newel post formed of a cluster of spindle balusters, with the rail running down and forming a cap. A cluster of leaded glass windows is an attractive feature of the staircase. The parlor is treated in the Colonial style with white enamel, and contains an attractive window seat, an open fireplace with tiled facings and hearth, and a mantel of exquisite design. The library is

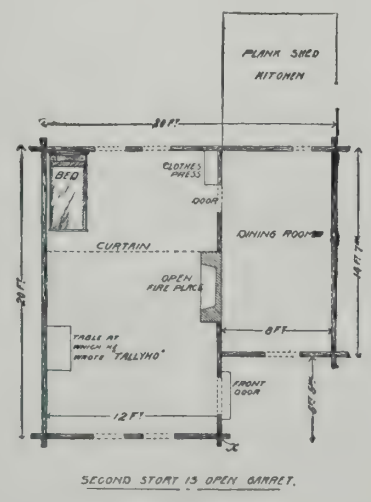
trimmed with curly birch, and has a paneled wainscoting and ceiling beams. The window-seats and bookcases are built in a unique manner. The fireplace is trimmed with tiles and mantel of brick. The dining-room is finished in Old English oak, with ceiling beams of the same material. It contains a buffet built in, and an open fireplace with tiles and wood mantel. The kitchen and its apartments are trimmed and wainscoted with yellow pine, and finished natural. These apartments are furnished with the best modern fixtures complete. The second floor contains three bedrooms, sewing-room, nursery, closets, and bathroom. This floor is trimmed with whitewood, with the exception of the nursery, which is trimmed with Southern pine. The bathroom is trimmed and wainscoted with oak, and contains porcelain fixtures and exposed nickelplated plumbing. The third floor contains three servants' bedrooms, store room for clothes, and billiard room. A cemented cellar contains laundry, furnace, cold storage room. Cost, $8,000 complete. Messrs. Clough & Reid, architects, Main Street, Holyoke, Mass.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

JOAQUIN MILLER'S CABIN AT MERIDAN HILL, WASHINGTON, D. C.

JOAQUIN MILLER'S CABIN AT MERIDAN HILL, WASHINGTON, D. C.

IN the accompanying engravings we give an illustration of Joaquin Miller's cabin on Meridan Hill, at Washington, D. C. This cabin was erected in 1882 upon land adjoining that of Capt. Richard Dubois, in whose company, one day, Miller remarked, while standing on Meridan Hill: "Well, I have seen Rome and Florence, and you may burn Rome. Can you secure this spot for me?" Through Captain Dubois the land was purchased and the cabin built. Mr. Miller, with his own hands, cut down a persimmon tree that obstructed the view, and, hewing it to shape, made it the front sill of his dwelling. The rose bush in front of the double windows was planted by Mr. Miller. The pile of stones at the right of the picture marks the site of his well, which formerly had an old-fashioned sweep. Mr. Miller, in living in this humble abode overlooking the National Capitol, sought to teach a lesson of simplicity and economy, and in answer to the question put to him on one occasion as to why he built so small a house, replied: "The smaller the house, the more stars overhead, and the more flowers underneath feet: it takes but a small home to hold happiness." While living there from 1882 to 1885 Mr. Miller was visited by many distinguished people, and was sometimes annoyed by the vulgar curiosity of callers, who frequently amounted to one hundred a day. His cabin marked the beginning of a cabin craze throughout the country. Mr. Miller was accustomed to decorate the interior walls of his cabin with unused MSS. and his tax bills, and when his roof began leaking, instead of repairing it, he built another one over it. The cabin contained three rooms, the front of which was about 13 x 15 feet, with the two windows in front and the door at the side. Back of this was the bedroom, about 8 x 12, with a communicating door leading to a small pantry serving as kitchen and washroom, about 8 x 8 feet. This pantry had a rear door opening into a backyard which Mr. Miller never inclosed. The rooms were ceiled with planed pine, and there was a garret above, with a trap-door and ladder leading from the bedroom. There was no interior plaster, except the mortar necessary to bind the logs, and the partition walls and ceiling were of plain pine boards. A rough pine table, two or three chairs, and the homemade bedstead constituted about all its furniture. There was no cellar, the logs resting on the shallow foundation of large rough logs, with a pine floor resting on beams. The plan shows the interior arrangement, and also the position of the table at which he wrote "Tally-Ho!"



Our engravings were made directly from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN DWELLING AT SOUTH HAVEN, MICH.

WE present, on page 55, in this issue, a modern dwelling, which has been erected for L. S. Monroe, at Monroe Park, South Haven, Mich. The design is attractive, and the plans are arranged in a most convenient manner for a summer house. The underpinning is built of local brick. The first story is covered with sheathing and then clapboards, and painted Colonial yellow, with ivory white trimmings. The second story is also sheathed and then covered with shingles, and stained a bottle green, with white trimmings. The roof is shingled and left to weather finish. Dimensions: Front, 26 ft.; side, 32 ft., not including piazza. Height of ceilings: first story, 9 ft.; second, 8 ft. The interior throughout is trimmed with Norway pine, finished natural. The hall contains an ornamental staircase turned out of red oak. A toilet is conveniently located beneath this stairway. The parlor contains an open fireplace built of pressed brick, with hearth and facings of same, and oak mantel. The dining-room is separated from the parlor by an archway. The kitchen is fitted up with sink, dresser, and drawers. The second floor contains three bedrooms and a closet. The house is supplied with cold-water plumbing. Cost, $1,000, complete. Mr. A. M. Worthington, architect, Bellevue, Mich.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

AN ENGLISH VILLA AT FOREST HILL, NEWARK, N. J.—See 54.

RESIDENCE OF F. C. FOSTER, ESQ.

First Floor Plan.

Second Floor Plan.

A RESIDENCE AT HOLYOKE, MASS.—See page 42.

MESSRS. CLOUGH & REID, ARCHITECTS.

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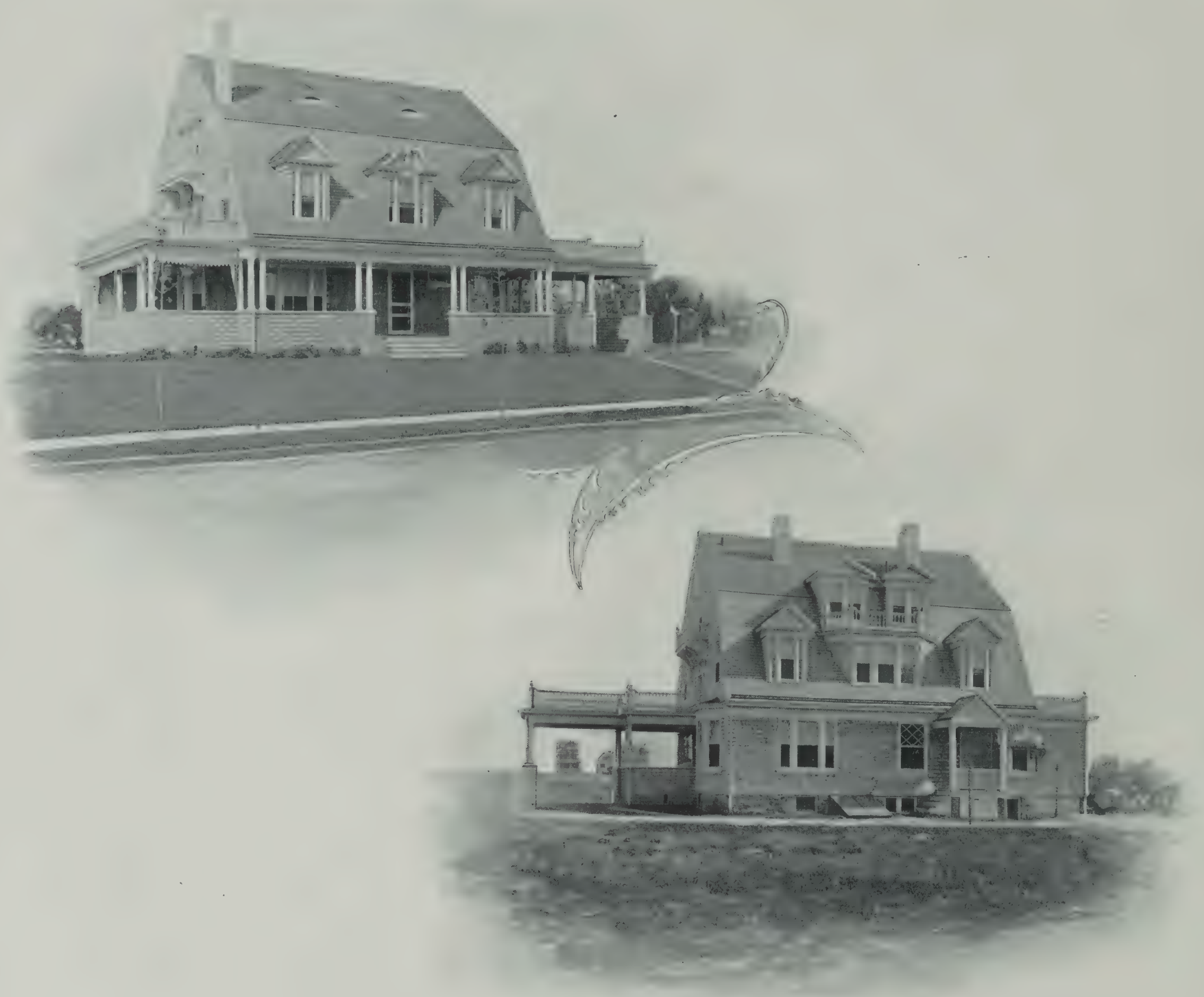
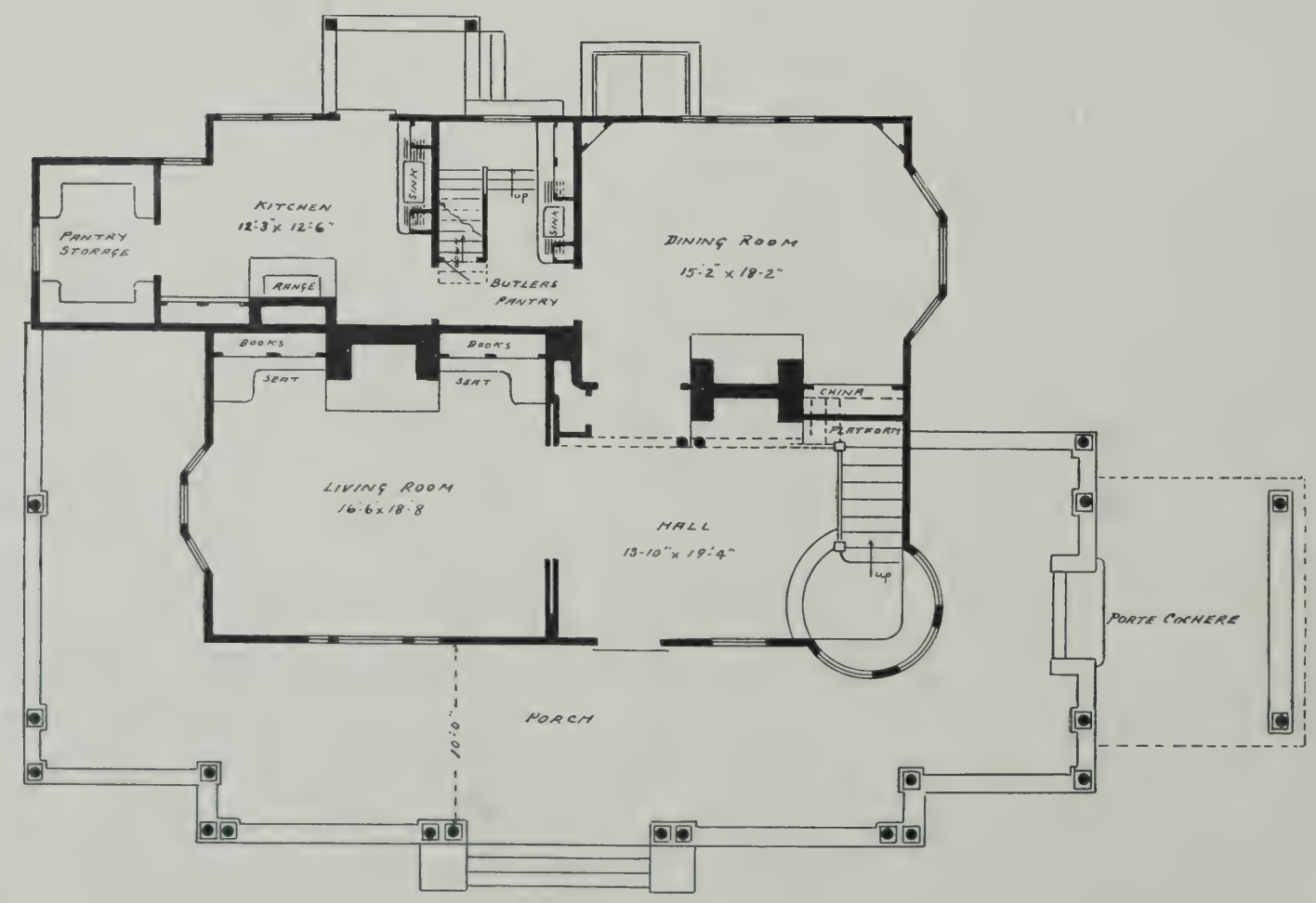
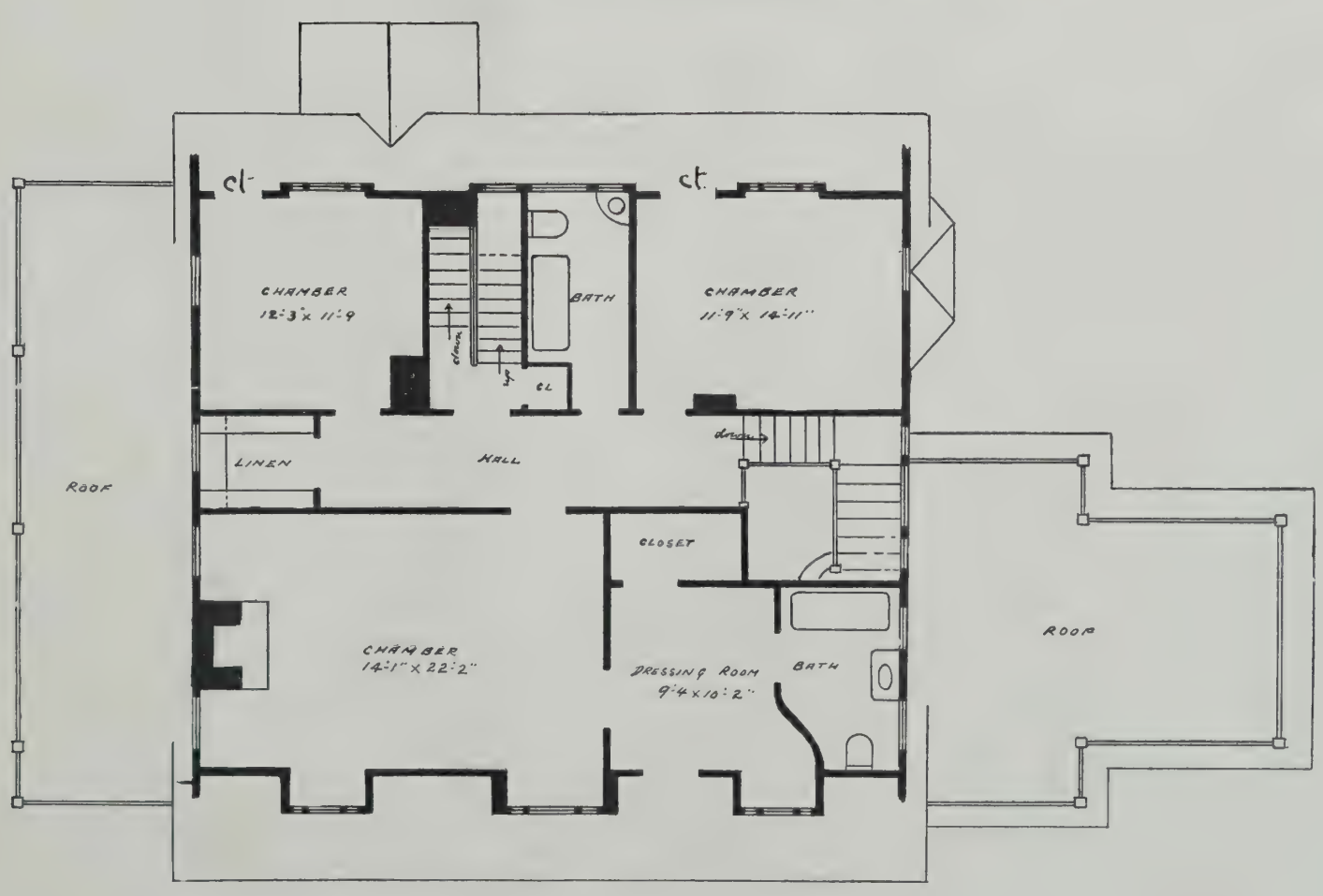




FIRST STORY PLAN

A COLONIAL RESIDENCE AT YONKERS, N. Y.—See page 54.

MR. HENRY C. PELTON, ARCHITECT.



SECOND STORY PLAN

A COLONIAL RESIDENCE AT YONKERS, N. Y.—See page 54.

MR. HENRY C. PELTON, ARCHITECT.

A MODEL HOUSE AT SOUTH ORANGE, N. J.—See page 42.

MR. J. H. COOK AND MR. FISHER MILLER, ARCHITECTS.

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THE STATE BEDSTEAD—THE SCHLOSS-NEUSCHWANSTEIN IN BAVARIA.

THE SCHLOSS-NEUSCHWANSTEIN IN BAVARIA.—See page 56.

VON RIEDEL, VON DOLLMANN, AND J. HOFMANN, ARCHITECTS.

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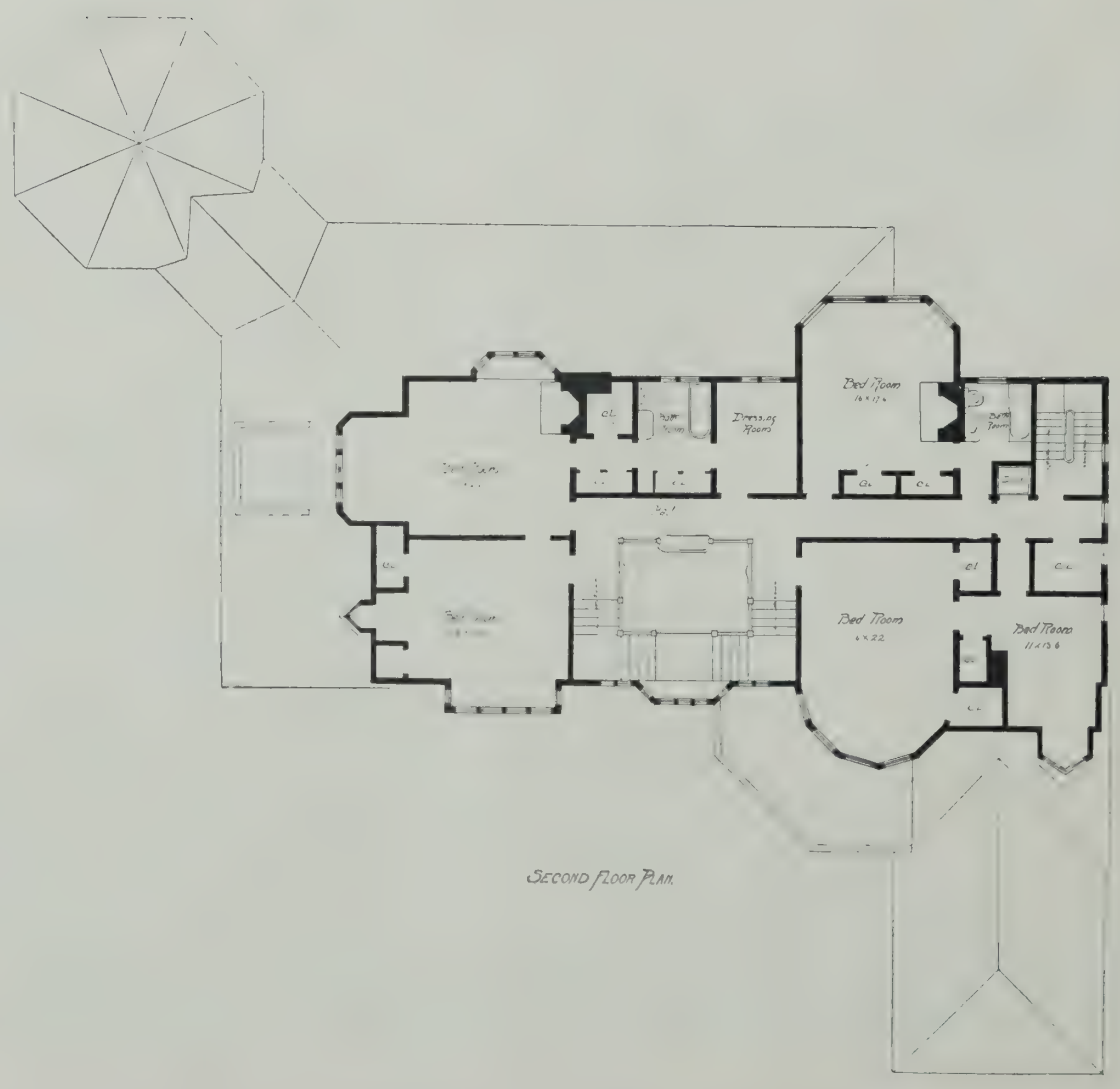

A RESIDENCE AT BELLE HAVEN, CONN.—See page 42.

MR. CHARLES P. H. GILBERT, ARCHITECT.

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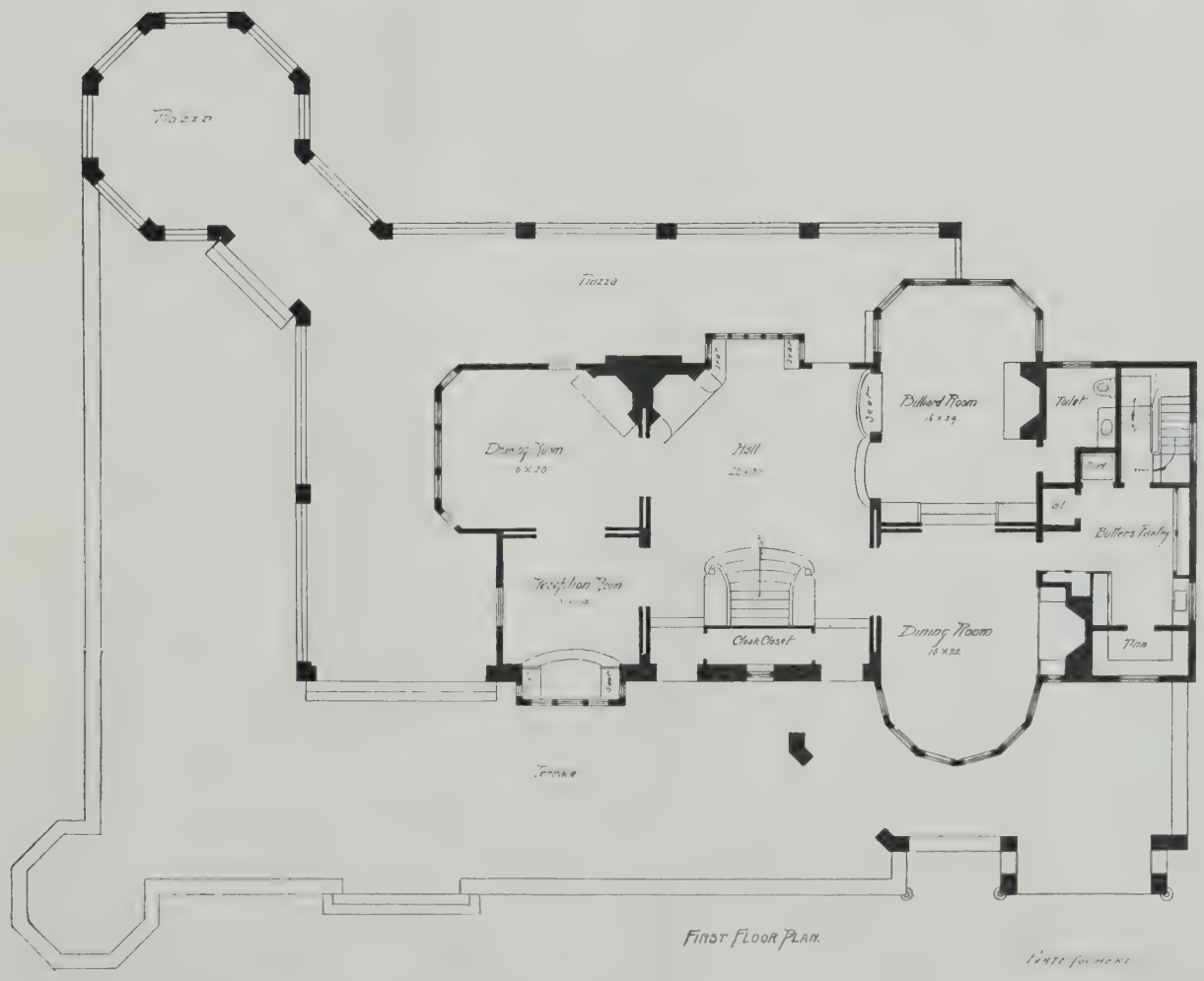
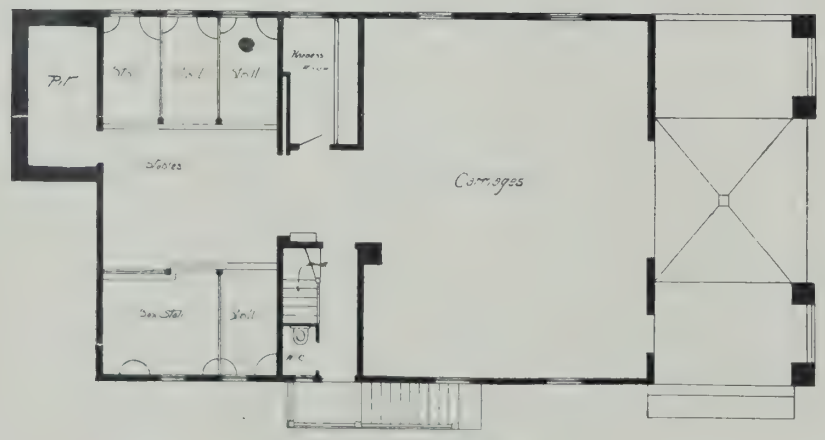


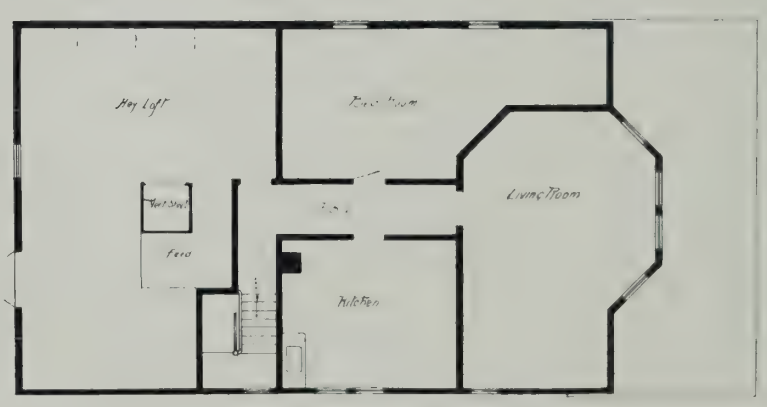
A RESIDENCE AT BELLE HAVEN, CONN.—See page 42.

MR. CHARLES P. H. GILBERT, ARCHITECT.

PUBLIC LIBRARY



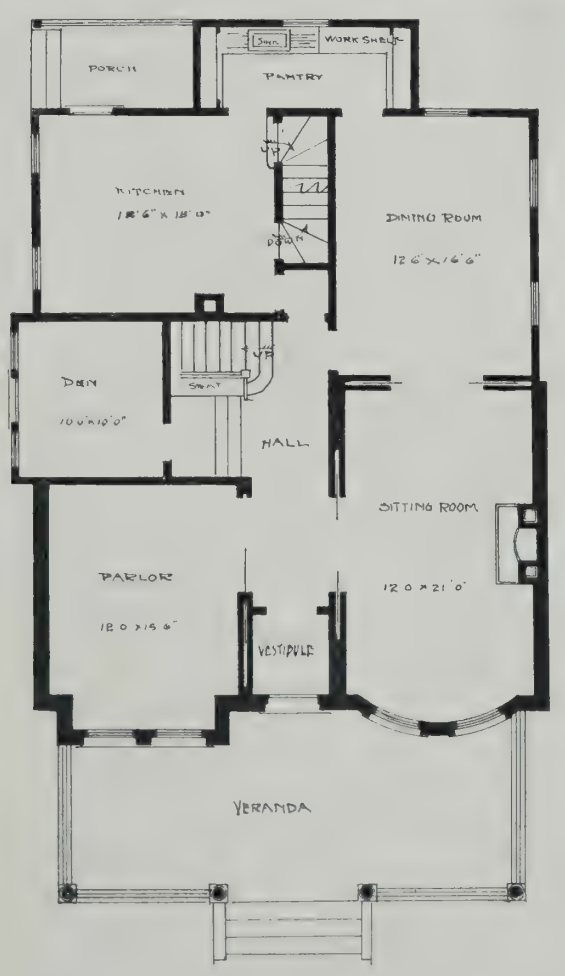
First Floor Plan.



Second Floor Plan.

A STABLE AT BELLE HAVEN, CONN.—See page 58.

MR. CHARLES P. H. GILBERT, ARCHITECT.



·FIRST·FLOOR·PLAN·

·SECOND·FLOOR·PLAN·

A MODERN RESIDENCE AT SCRANTON, PA.—See page 54.

MR. E. G. WORDEN, ARCHITECT.

PUBLIC LIBRARY

AN ENGLISH VILLA AT FOREST HILL, NEWARK, N. J.

We present on page 44 in this issue an excellent design for an English villa, which has been erected for F. C. Foster, Esq., at Forest Hill, Newark, N. J. The engravings present a unique rambling style of house, with a combination of brick, shingle, and half-timber work most pleasing and attractive. The underpinning and part of first story are constructed of red brick laid up in red mortar. The main part of the first story is covered with shingles and stained a dark red. The beams are painted a similar color, while the spaces between beams are plastered and left in their grayish white. The roof is covered with shingles and is stained a dull green. Dimensions: Front, 64 ft.; side, 29 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The main hall is trimmed with oak. It contains an ornamental staircase turned out of oak, with columns rising to ceiling with carved capitals. The hearth and open fireplace are built of brick, and finished with an oaken mantel shelf supported on wrought-iron brackets. The parlor is trimmed with pine, and is treated in a pinkish white and bronze. The fireplace is furnished with tiled facings and mantel, with mirror. The library and dining-room are trimmed with oak, and are separated by columns rising to the ceiling, with spindle transoms built in spaces. The library contains built in bookcases, and an open fireplace with tiled facings, and hearth and mantel. The dining-room is provided with china cabinets built in, with leaded glass doors. The floors on first story are laid of oak in parquetry designs. The kitchen and pantries are finished off complete, and contain all the best modern improvements. The second floor is trimmed with white pine and treated in delicate tints. This floor contains three bedrooms, den, servants' bedroom, many well fitted up closets, and a bathroom furnished with the usual fixtures and exposed plumbing. The third floor contains ample storage room. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $5,500 complete.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

COLONIAL ARCHITECTURE.

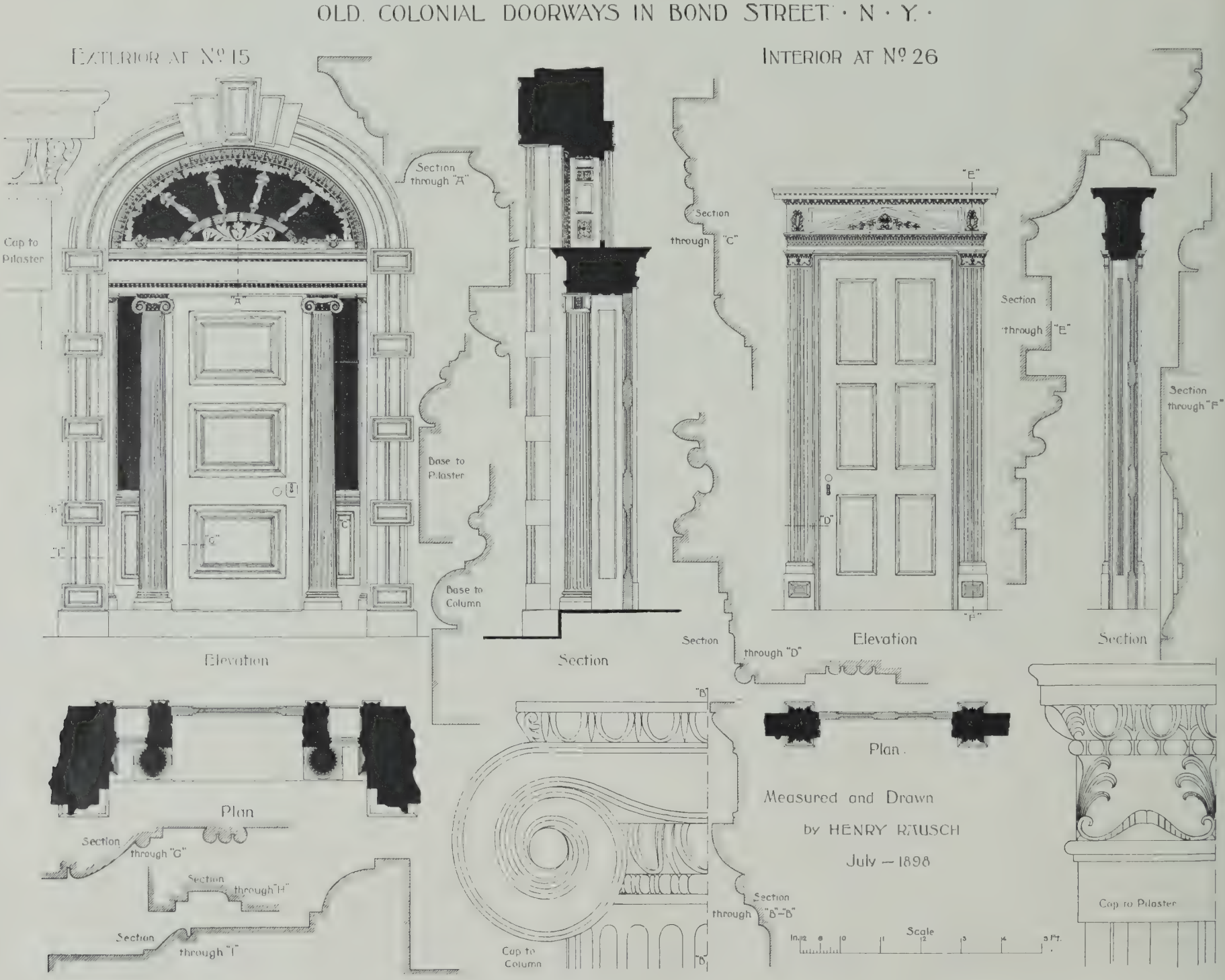
The drawing herewith printed represents the plans, elevations, and sections of two doorways in Bond Street, of the Colonial style of architecture, reproduced from careful measurements taken on the spot, and giving detail sections of moldings, bases, caps, etc., of both.

The arched doorway at No. 15 is an exterior piece of work, and was the entrance to a house which, among others, has been removed to improve Elm Street. The doorpiece was in quite a dilapidated condition, parts of it being removed or destroyed, but sufficient remaining to admit of a correct representation of original.

The other subject represented, at No. 26, is interior work, still in existence and in fairly good condition. The work is of mahogany, but unfortunately the numerous coats of paint which have been applied from time to time have almost obliterated the finer lines in the wood carving.

This style of architecture was in vogue fully sixty years ago, and where it is still to be found in the older parts of the city dates from about that period. Almost all of this style of work is to be found in what at one time were the most fashionable localities.

Henry Rausch.



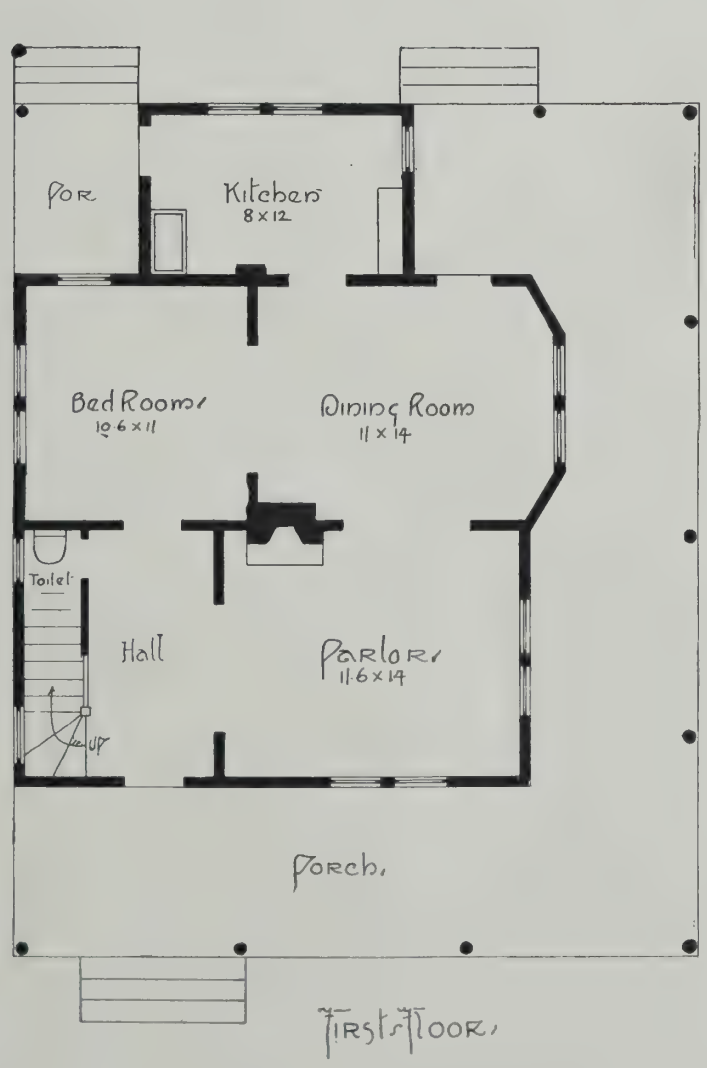
A COLONIAL RESIDENCE AT YONKERS, N. Y.

We present as the subject for colors, and also on pages 46 and 47 in this issue, a residence of Colonial treatment which has been erected for Walter E. Hodgeman, Esq., at Yonkers, N. Y. The building is treated in a most artistic manner, both on the interior and exterior, the latter having many excellent features, including the broad, spacious and well-shaded piazza, porte-cochère, dormer window, and balconies. The underpinning is built of rock-faced bluestone. The superstructure is of wood, and is covered on the exterior framework with sheathing, paper, and white cedar shingles, left to finish in their natural state. The trimmings are painted cream white. Dimensions: Front, 51 ft.; side, 31 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. 6 in. The interior is finished off in a handsome manner, is trimmed with white pine throughout, and is treated in old ivory white. The hall, a very attractive apartment, contains an ornamental staircase which rises up from a platform throne into a circular bay window. This platform is provided with seats. The staircase is painted white, and it has turned newels, treated similar, and a mahogany rail. This hall has a paneled wainscoting and an open fireplace built of Roman brick, with hearth and facings of same, and a neat wooden mantel shelf. This fireplace and entrance to dining-room is recessed by arches supported on columns of Colonial style. The living room is treated in a neat manner, with an open fireplace built of Roman brick, with facings and hearth of same, and a mantel shelf. Paneled divans are placed at either side of fireplace, with book-shelves over same provided with latticed glass doors. The dining-room is provided with a fireplace of similar character, and china closets built in two corners of room, with glazed doors of latticed design. The kitchen and its apartments are fitted up in a most complete manner, and are provided with numerous cupboards, butler's pantry, storage, etc. The second floor contains three bedrooms, large closets, dressing-room, and two bathrooms, wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and two trunk rooms. A cemented cellar contains furnace, laundry, and other necessary apartments. Mr. Henry C. Pelton, architect, St. James Building, 1133 Broadway, New York city, N. Y.

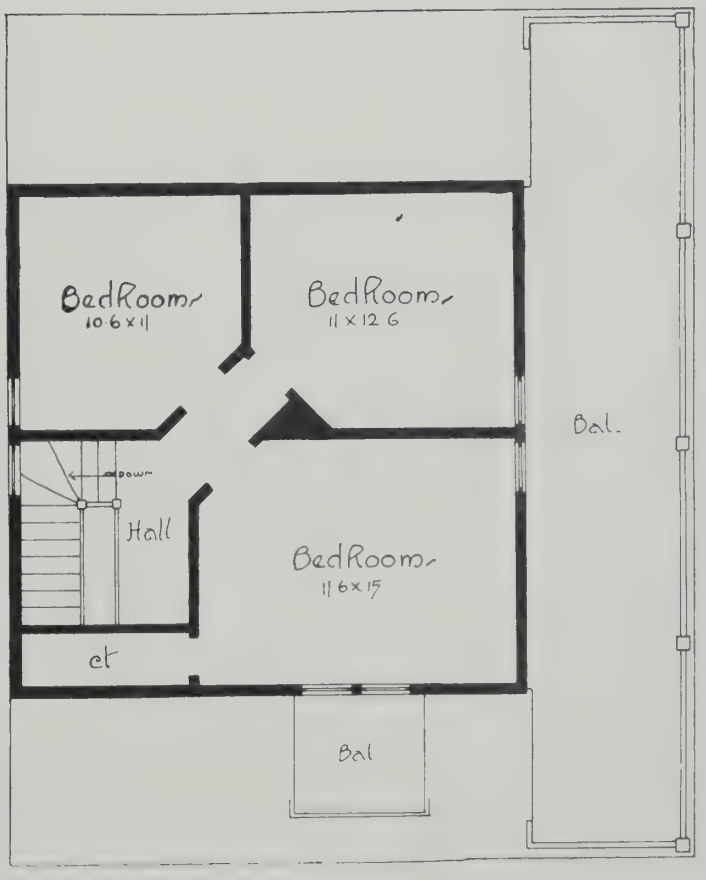
Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN RESIDENCE AT SCRANTON, PA.

The engraving presented on page 53, in this issue, illustrates a modern residence, which has been erected for Mr. E. G. Conery, at Scranton, Pa. The illustration presents a design executed in a very handsome manner, with excellent features and good detail. The underpinning and first story are built of rock-faced brownstone. The remainder of the building is of wood, with the exterior framework covered with sheathing, paper, and clapboards. It is painted Colonial yellow, with cream white trimmings. The roof is covered with shingles and stained a mottled green. Dimensions: Front, 36 ft.; side, 34 ft., not including piazza. Height of ceilings:



First Floor.



Second Floor

A MODERN DWELLING AT SOUTH HAVEN, MICH.—See page 43.

MR. A. M. WORTHINGTON, ARCHITECT.

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Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The interior plan is most excellently arranged. The first floor is trimmed with quartered oak. The vestibule has a tiled floor and paneled wainscoting. The hall contains a very handsome staircase, with newel posts and balusters of handsome design. There is also a paneled seat at side of staircase. The floor in hall is of polished oak. The reception-room is treated with white enamel, and has a false fireplace, with mantel of excellent design. The sitting and dining rooms are trimmed with oak and finished natural; the former contains an open fireplace, trimmed with tiled facings, and hearth and mantel. The kitchen and its apartments are trimmed and wainscoted with yellow pine, finished natural, and are furnished with all the best modern conveniences. The second floor contains four bedrooms, large closets, dressing-room, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed plumbing. The third floor contains three bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Cost, $6,000, complete. Mr. E. G. Worden, architect, Board of Trade Building, Scranton, Pa.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

THE SCHLOSS-NEUSCHWANSTEIN IN BAVARIA.

Bavaria is one of the most interesting sections of Germany, and it has always been a favorite with tourists, especially since the Passion Play began to be well attended by foreigners at the performances of 1870–1871. Munich itself, with its attractive shops and its magnificent galleries of paintings and sculpture, never fails to interest the visitor, notwithstanding the fact that it is situated on a flat plain. King Ludwig I. of Bavaria worked from 1825 to 1848, and placed the city in the foremost rank as a school of German art, having as his aids the sculptor Schwanthaler, who provided the plastic embellishments, and Cornelius, who, with his pupils, painted vast wall surfaces with frescoes. The same king restored the cathedrals of Bamberg and Ratisbon, and erected on the Danube the "Walhalla," or Pantheon of German heroes. It remains to-day one of the most extraordinary of modern buildings. Ludwig I. really attempted to do the work of centuries in a quarter of one. After a somewhat stormy reign, he retired in favor of his son, Maximilian, who died in 1864, leaving the crown to Ludwig II., who was then a boy of seventeen.

Ludwig II. was, unfortunately, also afflicted with the building mania, and was also insane, and there is hardly a more picturesque scene in all of German history than that of Wagner giving the most splendid concerts with the king as his sole auditor. When the desire to create great architectural works seized him, instead of decorating the buildings which were already in existence or building new ones, he spent vast sums upon ornamenting the various palaces which he possessed and in the creation of new ones. The trip from Munich to Innsbruck through Partenkirchen gives the visitor an excellent idea of the wonderful scenery of the Bavarian highlands, and also gives an opportunity of visiting Hohenschwangau, the romantic castle, which is the home of the mythical story of Lohengrin immortalized by Wagner. Linderhof and Neuschwanstein, favorite homes of Ludwig II., may also be visited. Both of the latter palaces are superb and are worthy homes for a king.

Neuschwanstein is remote from any large city or town, and is perched on a high bluff with abrupt precipices on three sides. Its Gothic arches compose admirably with the landscape, backed by the Tyrolese Alps. The engraving, page 49, represents the castle from the south. It is approached on one side through a long, solitary forest. It is said that the king used to travel to his château from one of his other castles by night in an open carriage attended by outriders on horses, bearing flaming torches. The building was erected by the architects Von Riedel, Von Dollmann, and J. Hofmann. The palace was left unfinished by the king, and the expense of the vast pile was enormous.

The palace was elaborately decorated with pictures by Piloty and other German artists, the subjects being from Wagner's operas. The castle was built on the site of the old castle of Vorden-Schwangau. The views of the private ravines at the base and of the several lakes is most magnificent. The walls of the dining-room are covered with pictures dedicated to "Meistersingers of Nuremberg," and the king's bedroom was consecrated to the memory of "Tristan and Isolde." It is decorated in blue and gold, and the splendidly carved wooden bed is richly encrusted with gold. Out of this room opens the oratory, for the king was most devout. Other rooms are hung with purple velvet embroidered with peacocks, and each room seems to surpass the other in magnificence.

On the other side of the house is the throne-room, which is a magnificent example of Byzantine architecture. It is surrounded with a double gallery of arches, and inlaid with the rarest Oriental mosaics, and supported by pillars of porphyry and lapis lazuli. A vast dais of white marble was to have held the throne, but, like many parts of the building, it remains unfinished. There is also a splendid theatre in the castle dedicated to "Parsifal." A short distance from the palace is the Meisenbrücke, a handsome bridge, 150 feet long, which spans the rocky gorge of the Polate at a height of 290 feet above the waterfall. While we must deprecate the building of such an immense palace in such an inaccessible place, it must be remembered that it was intended solely as a residence of a very erratic king who was extremely fond of solitude, and there is hardly a place in the world to which he could have gone where this solitude would be better guaranteed. For our engravings we are indebted to the Blätter für Architektur und Kunsthandwerk.—Verlag von Julius Becker, Berlin, SW.

Joints for Cast-Iron Pipes.

There is probably no more inviting field now open to the inventor than that which is created by the demand for better methods of joining cast-iron pipe than are now known and practiced. To meet the requirements of general use, a joint must be reasonably cheap, and applicable to pipes as they come from the sand. Tool work of any kind would render them too expensive; and, like the pipe, the coupling must be of cast iron. To be accepted as a substitute for the hub and spigot joint, it must be either cheaper or better. To render it cheaper would be difficult, if not impossible; but the advantages of a better joint than that which can be made by means of calked lead are so great that economy becomes, within reasonable limits, a consideration of secondary importance.

FOR WATER MAINS

the hub and spigot joint is probably as generally satisfactory as any which could be devised. Cast-iron pipes are not strong enough to be trusted under heavy working pressures, and are rarely employed for water conveyance under conditions which make them leaky at the joints. The lead packing of the hub is measurably plastic under the strains to which it is subjected. So far as expansion and contraction are concerned, their movement is very slight, and this is accommodated by the lead. The fact that water usually, if not invariably, carries more or less finely divided earthy matter in suspension enables it to close small leaks which would ordinarily give trouble, and it is only under unusual conditions that calked joints in water mains need repairing where such lines are properly laid and the joints carefully made. In this use the only serious objection to the present standard joint is the great weight of the hub and the cost of making good joints in time consumed and lead used or wasted. In water pipe the hub represents about 20 per cent. of the weight. In transportation and handling this is an item of consequence, and the saving of any part of this dead weight would be of advantage both to makers and users. A large part of the loss due to foundry defects results from the cracking of pipes in cooling from the unequal contraction of the hub and the body of the pipe next it, and the fact that parts to bear the strain of solid and usually unequal calking need to be made heavy makes the loss from this cause one of the fixed charges of the pipe-founding industry. For diameters above 24 inches the cast-iron pipe is steadily losing ground through the competition of the riveted steel tubes, which are at once lighter and stronger. In most of the important hydraulic work now in progress riveted tubes are used almost exclusively. They lack many of the practical advantages of cast-iron tubes, and are necessarily less durable; but they are lighter and stronger, and, I presume, cheaper because lighter. A joint which would dispense with the ponderous hub would, to a great extent, re-establish the cast-iron pipe in the position from which it is now crowded by the competition of the riveted tube.

JOINTS FOR GAS MAINS.

The disadvantages of the calked joint in gas-distributing mains are much more serious than in the case of water mains. Under the least pressure at which gas can be distributed to consumers calked joints leak. This leakage, in addition to being a large and constant item of waste, is a nuisance to the public health and a constant source of danger to life and property. As a gas-conduit the cast-iron pipe is the best ever produced; but the impossibility of making tight joints by the only means now available has led to the experimental substitution of wrought-iron pipe with screw couplings, though without satisfactory results. Wrought-iron pipes have a much shorter life in the ground than cast-iron pipes, and rigid joints do not meet the requirements of gas distribution. Expansion and contraction are much greater in the case of gas pipes than with those kept at a measurably constant temperature by water. Unless this movement is provided for at the joints it exerts itself with irresistible force upon the pipes, and gas engineers prefer leaky joints to broken mains.

The requirements of a satisfactory gas joint adapted to cast-iron pipes are not met by a lead packing under any conditions. Primarily, a joint needs to be gas tight, while a calked joint never is. It must admit of a longitudinal movement of the pipes as they expand and contract. Roughly speaking, a gas main will vary its length almost two inches in 1,000 feet between summer and winter. This is enough to open every calked joint in a line, however well made ordinarily. There is also a slight change in diameter between summer and winter, and as lead yields readily to compression, but has no resilience and never recovers its original form, the tendency of this movement is to leave the lead loose from the iron all around. A gas joint also needs to be somewhat flexible. Mains are laid in all kinds of ground, and the ripest engineering skill and experience have not yet devised any way of keeping them in line. This is especially true in cities. The constant excavation of the streets undermines the gas mains, and it is not unusual to find them thrown as much as 10 or 12 inches out of line at the joint which has been cut under and filled over by a reckless contractor. With a rigid joint this would mean breaking the main short off, with disastrous consequences. This sometimes happens as it is, but less frequently with the hub and spigot joint than it would with a rigid joint. Under such circumstances the calked joint leaks badly, but ordinarily it can be jacked up and recalked without great expense. The ideal gas joint would meet all these requirements, and when found it will be adopted with enthusiasm. The inventor who essays this problem, however, would do well to remember that the packing of a gas joint must be a material which gas does not act upon. It destroys all rubber compounds very quickly, and there are few elastic compositions now known which are not dissolved or disintegrated by it. The fact should also be kept in mind that to be practical a gas-joint packing should be capable of resisting the destructive agencies which attack all substances buried in the ground. Frequent renewal of the packing material of gas joints is impossible. It must be as durable as cast iron itself. With their present knowledge the gas engineers cannot do any better than they are now doing. Leaky joints must be tolerated or gas distribution abandoned in cities unless a joint can be devised for cast-iron pipes which will correct the defects of the calked lead joint without creating new evils more serious than those now complained of. The inventor who solves this problem will reap a rich reward.

JOINTS FOR IRON SOIL AND WATER PIPES.

The objections to the calked joint for gas mains apply in part to such joints in plumbing practice, but as the requirements in housework are fewer and less arbitrary than in the case of gas distribution, the problem of a satisfactory joint in iron soil and waste pipes would appear to be much simpler and easier of solution. The calked joint is the weak point of modern plumbing practice. In the examination of a building, the experienced sanitary inspector always looks first for defective joints in the main lines of iron pipe, and rarely fails to find them. Not only is it a matter of no little difficulty to make good joints by the present method, but defects due to lack of skill or to carelessness on the part of the plumber are readily concealed and very difficult of detection.

In housework cast-iron pipes are run in places not always easy of access, and, in passing, the plumber is under the necessity of often working in very awkward positions. When this necessity confronts him his gasket of oakum or paper, or whatever else is handy, is usually so disposed in the lead space of the joint as to insure that the lead will meet on the side opposite to that at which he pours. If a mechanic of experience, he knows that unless he can pour quickly the metal will chill and set before it has filled the hub. Consequently, the gasket is so arranged as to give a comparatively deep pocket in front, where the lead is poured, and a shallow space behind, where the streams of molten metal, flowing around the pipe, are to meet and unite. Where it is difficult to pour, it is even more difficult to calk. This fact accounts for much of the slighting of joints in housework; but even when every care is taken to make a good joint the lead is very seldom of equal depth all around the joint. The writer once had occasion to remove from a large number of 8-inch and 10-inch tubes the cast couplings which had been attached to them by calked lead joints. These joints were made in the mill, under very favorable conditions for both pouring and calking. The work was intrusted to good men, under competent superintendence. Since the castings were too light to be serviceable, and as scrap were as valuable broken as whole, they were broken off to save time, leaving the lead collars encircling the pipe ends. In not one case in fifty was a leading found to be even approximately equal all around. Some were two inches deep on one side, and one-half inch deep on the other. Such inequalities are often found in housework, and to avoid them calls for more of skill and honesty than this class of work is usually supposed to demand. Thorough calking insures temporary tightness, if delayed until the joint has cooled to atmospheric temperature, but the slightest movement destroys this quality and gives us a defective and leaky joint.

The writer once witnessed an experiment with the calked joint which was instructive. Two short pieces of pipe, one having a hub end and the other a spigot end of the usual form for 6-inch water pipe, were set up on a shop floor under conditions favoring the making of as good a joint as possible. An open gasket was packed in, and the lead so poured as to insure the equal filling of

the space provided for it. It was calked after setting, and recalked when quite cold. This work was done solidly and well, and nothing was neglected or slighted. The joint was then tested, and with a little supplementary calking made "as tight as a bottle," under a pressure of 400 pounds to the square inch. The work was then laid aside, care being taken that it should not be reached by the sun nor in any way disturbed. Just before the works closed down for the day it was retested. With the first stroke of the pump the water flew in every direction, and the gauge returned to zero as rapidly as the copious and increasing leakage would permit. The demonstration was conclusive. It showed that a calked joint could not be made which would remain tight under such slight contraction and expansion of the iron as was due to the difference between an atmospheric temperature of about 84 degrees and water at about 72 degrees Fahrenheit. The range of temperature to which house pipes are subjected is much wider than this, and the transitions are often quite sudden. It is not surprising, therefore, that even in good work we find defective calked joints. That the plumber is not always, if often, to blame for such defects may be the more readily admitted, since he could not so make his joints as to warrant him in insuring them through 24 hours of use.

What is needed for the satisfactory joining of cast-iron pipes of the kind now standard would seem to be an elastic, indestructible substance adhering strongly to iron, and flexible enough to admit of more or less disturbance without rupture or fracture. It must, of course, be tough and strong, insoluble in water, and not affected by gases. In some respects lead comes nearer to meeting these requirements than any other known substance, but it falls far short in others. That nature has not given us, ready made, such a material as we need, is probable. Whether it can be produced, who shall say? Failing to find it, the task of the inventor who would seize the opportunity here offered is to give us a new form of joint for cast-iron pipe in which lead will do better work than can be expected of it as a packing in the hub and spigot joint.—Metal Worker.

Heaters and Heating Pipes for Greenhouses.

THE greatest economy and most satisfactory results cannot be obtained from a heating plant unless it is adapted in all its parts to the work that is expected of it. Aside from the unnecessary first cost, unless the excess is too great, the objections to a plant with an excess of surface in any portion will be comparatively light compared to those that can be urged against one that on account of a deficiency has to be forced to such an extent that there is loss both in economy of fuel and attendance, as well as from the injury that is likely to be done to the boiler through hard firing.

While the efficiency of the system will depend to a large extent upon the arrangement of the heating pipes and the construction of the boiler, for our present purpose we need only consider whether the various parts of the system are proportioned to each other and to the work that is expected of them. We may select as of vital importance: 1. The grate area, or the surface over which the fuel is spread while combustion is going on. 2. The area of the fire surface, or heating surface, as it is termed by some, which refers to the area of the water exposed to the action of the fire. 3. The amount of radiating surface to be supplied. Having fixed upon the ratio which each of these should bear to the others, the task still remains of determining what shall be their relation to the size of the building to be heated. We find hundreds of forms of cylindrical tubular boilers, which are those most commonly used for heating purposes, and there is a great variation in the ratio between grate and heating surface in the different kinds. As might be expected, in the larger sizes the relative amount of heating surface is increased, but this is accompanied by an increase both in the draft and the amount of attention in firing. The ratio is even greater in boilers designed for power purposes than in those intended for heating only.

WHAT IS A HORSE-POWER?

We estimate the capacity of a boiler as so many horse-powers, which is commonly understood as the amount necessary to raise 33,000 pounds the height of one foot in one minute, and it has been found that a boiler of the kind under consideration will be able to supply power equivalent to 1 horse-power for each 15 sq. ft. of heating surface that it possesses. The same measurement is also practically correct for the plain cylindrical and the cylindrical flue boilers.

RATIO OF GRATE AND HEATING SURFACE.

For modern boilers of less than 20 horse-power, the common practice to-day is to reckon that about ¾ ft. of grate area will be necessary for each horse-power; or, to put it another way, they have 1 sq. ft. of grate surface to every 20 ft. of heating or fire surface. In boilers of a capacity ranging from 50 to 75 horse-power the ratio is much greater, being from 30 to 35, or even 40, where a strong draft is provided and a fireman is constantly in attendance. For the greatest economy of fuel, to say nothing of the saving in attendance, the lower ratio will generally be found preferable in boilers for ordinary greenhouse establishments, although this might be modified by the character of the fuel used.

RATIO OF HEATING TO RADIATING SURFACE.

While it might be slightly modified under some conditions, there is but one ratio between the area of the fire or heating surface and the radiating surface provided by the coils in common use. This is about 1 to 7; or, in terms of horse-power, 100 ft. of radiating surface is thought to require 1 horse-power in the boiler when used for the heating of ordinary buildings where the mains are not available as heating surface; but in the greenhouse, where the contrary is the case, a slightly larger ratio is sometimes employed. The above computation is made for low-pressure steam, and when the fires are not pushed.

COMPUTING THE GLASS AREA.

Unlike other buildings, the cubic contents of a greenhouse are not considered in making up the estimate of the amount of radiating surface that will be required to heat it. While it will, of course, vary to some extent, with the number and size of the cracks in the walls and roofs, with the exposure of the building to the prevailing cold winds, as well as with the temperature that is to be maintained inside, and the minimum that is likely to occur outside, the area of the exposed glass and wall surface alone is used in determining it. As a minimum temperature 10 degrees below zero is generally taken, and a ratio has been established, based upon the average of the experiences of many florists, between the area of the exposed glass surface and that of the piping that will be required for the various temperatures. This will be about right for greenhouses in fairly good condition and with an average exposure. The ratios can be slightly increased or decreased to suit the conditions. It is evident that tight wooden walls will allow much less heat to escape than the tightest of glass areas, so that we must make allowance for this in making our estimates. Although if the walls are well built, 8 or 10 sq. ft. would probably not give off more heat than 1 sq. ft. of glass, it is customary to take 1 to 5 as the ratio, and, after ascertaining the area of the exposed glass, to add to it one-fifth of the exposed wall surface.

As an example, let us suppose that we have a house 100 ft. long, 20 ft. wide, 11 ft. high at the ridge, and with walls 4 ft. high, there being a row of glass ventilators 18 in. wide in one wall. From ridge to plate it will measure about 12 ft. in an even span house, while if three-quarter span it will be about 8 ft. upon one side and 16 on the other, so that in either case it will be about 24 ft. from plate to plate, measuring over the ridge. We shall then have for the glass area:

100 x 24	=	2,400 sq. ft. area of roof.
100 x 1½	=	150 sq. ft. area of wall ventilators.
20 x 3	=	60 sq. ft. area of glass in one gable.
725 ÷ 5	=	145 sq. ft. area, one-fifth area of wall surface.
Total.....		2,755

RATIO OF RADIATING TO GLASS SURFACE.

The following will be found to be a safe estimate for the piping of moderately tight and well-built greenhouses, where the mercury seldom falls below 10 degrees below zero, using low-pressure steam:

One square foot of radiating surface will heat to.....

40°	7½ sq. ft. of glass.
45°	6¾ sq. ft. of glass.
50°	6 sq. ft. of glass.
55°	5¼ sq. ft. of glass.
60°	4½ sq. ft. of glass.
65°	3¾ sq. ft. of glass.
70°	3 sq. ft. of glass.

In case hot water is to be used instead of steam, the ratio should be considerably smaller. It would not be far from right to use 1 to 5, 1 to 4½, 1 to 4, 1 to 3½, 1 to 3, 1 to 2½, and 1 to 2, respectively, for houses to be heated to the temperature noted above.

AMOUNT OF PIPE REQUIRED.

If steam is used, the pipes need not be so large nor as many as when hot water is employed to distribute the heat, but in the general arrangement there will be but little difference in the two systems. It will, as a rule, be found best to use mains, one or more for each house, which shall enter them at a point perhaps two feet below the ridge and continue to the farther end with a fall of one foot in twenty. The return coils may be located under the benches, upon the legs or sides of the beds, on the side walls, or on the purlin posts, as is most convenient. They should have a fall of 1 in. in 10 ft., and be provided with the necessary valves. Care should be taken in arranging the coils that at least one end is free, in order to provide for unequal expansion or contraction of the pipes.

In determining the size of the mains it will be safe to reckon that for steam a—

One and one-half in. pipe will supply 200 sq. ft. of radiation.

Two-in. pipe will supply 400 sq. ft. of radiation.

Two and one-half in. pipe will supply 800 sq. ft. of radiation.

Three-in. pipe will supply 1,600 sq. ft. of radiation.

For use with hot water it is not safe to reckon upon more than one-half of the above radiation, and this is excessive for short coils. It is also of importance to know the area of the surface of a linear foot of the different sizes of pipe. The size of wrought-iron pipe is determined by its interior diameter, but its heating surface is in proportion to its exterior circumference, which varies with the thickness of the pipe.

Each linear foot of 1-in. pipe contains 0.344 sq. ft.
Each linear foot of 1¼-in. pipe contains 0.434 sq. ft.
Each linear foot of 1½-in. pipe contains 0.497 sq. ft.
Each linear foot of 2-in. pipe contains 0.621 sq. ft.
Each linear foot of 2½-in. pipe contains 0.753 sq. ft.

With these data it will be a simple matter to estimate the amount of pipe required for a house of any size, whichever method of heating is employed. For a house of the size mentioned above, with the equivalent of 2,755 sq. ft. of exposed glass, it will require, using steam, to heat it to 65 degrees, 612.2 sq. ft. of radiating surface. For this it is evident that a 2½-in. main will be necessary. With 100 linear feet of this size of pipe in the main there will remain about 536.9 sq. ft. that must be supplied in the coils. Except for short coils, it will be as well to use 1¼-in. pipe in constructing the coils, and in each 100 linear feet of pipe we shall obtain 43.4 sq. ft. of radiating surface. It is evident that we shall need about 1,237 linear feet of pipe in the coils. If, as is desirable to allow for expansion, the coils are carried partly across one end of the house, the necessary radiation can be secured from 12 runs of pipe. Using 1-in. pipe it would take 15 or 16 runs. It should be understood that this is for low pressure, as, if the boiler will admit of carrying 15 or 16 pounds in extremely cold weather, there can be a considerable reduction in the required radiation.

Using hot water, 920 sq. ft. of radiation will be necessary, and we should do well to use either one 3-in., two 2½-in., or four 2-in. pipes. This would provide from 100 to 250 sq. ft. of radiation, leaving from 670 to 810 ft. to be supplied in coils. It will be best to use either one 1½ or 2-in. pipe, and of the former from 1,340 to 1,620 linear feet will be necessary, while of the latter it will need but 1,080 to 1,500 ft., or from 12 to 15 of the former size, with 10 to 12 of the latter. As to the exact arrangement of the pipes, so much will depend upon the character of the house and the kinds of crops for which it is to be used that no general rule can be given. With the data given above, however, a florist should be able to determine the size of boiler he will need, the amount of radiation he will require, and the number of heating pipes necessary to provide it.—L. R. TAFT, in Florists' Exchange.

Polluted Soil and Its Dangers.

POLLUTED water is so generally recognized as the prevailing means by which typhoid fever, cholera and other intestinal diseases are propagated that polluted soil, the chief adjuvant of polluted water, though scarcely less dangerous in its relation to intestinal diseases, and more dangerous in its relation to some other infectious diseases, and much more durable than polluted waters, is not infrequently overlooked.

Bollinger demonstrated the presence and long retained vitality of spores of bacillus anthracis in the soil nearly thirty years ago, and pointed out the important bearing of this retained vitality of germ spores on the question of soil infection generally; and referring to the irregularity in the outbreaks of epidemic diseases, he suggested their probable dependence upon the conditions, favorable or otherwise, under which the vitality of their germs was maintained.

Enormous numbers of bacteria in great variety have been found in the soil by various observers. Infusions made from manured fields and garden earth, even though diluted a hundred times or more, still contain thousands of bacteria in every drop: and the soil and dust of roadways and streets always contain large numbers. Beumer, in experimental researches for bacteria in the soil (1886), obtained from a specimen of sandy humus taken from the depth of three metres, 45,000,000 to the gramme. In a churchyard, at a depth of four metres, the number in one experiment was 1,152,000, and in another 1,278,000 to the gramme. Naegeli and Buckner have demonstrated that the porous soil of the earth will yield germs existing in it to ascending currents of the air even when wet, a fact which has a strong bearing upon the significance of the soil in the spread of infectious diseases generally.

When we reflect upon the continually accumulating mass of organic matter on the surface of the ground and in the subsoil of populous places, and particularly where there is no subsoil drainage, and consequently the need of bacteria for the transformation of such matter into its original elements, and consider the constant process of putrefaction in such soil by which it is decomposed and incorporated with the soil, dissolved in the soil water or taken up by the ground air, and consider the agencies by which these transformations are accomplished, we are prepared in some degree to appreciate the relations of bacteria, and the conditions by which they are sustained and propagated, to human health.

Fortunately for the well being of mankind, the saprophytic or salutary bacteria in the soil commonly greatly exceed in number the pathogenic bacteria or disease germs. And between these, as between the leucocytes

or white-blood corpuscles and parasites in the blood, there is an unceasing antagonism of forces.

As in the one case, an excessive accumulation of organic matter in the soil, and conditions of moisture and temperature more favorable to the multiplication of pathogenic bacteria than of the saprophytic, will promote the ascendency of the former; so, in the other case, if the physique is impaired from any cause, badly nourished, intemperance, overwork, etc., by which the leucocytes are diminished or enfeebled, they are in no condition to resist the invasion of pathogenic germs of any kind.

Bacteria of various kinds exist in the soil and retain their vitality for indefinite periods. Graucher and Deschamps assert that it is probable that pathogenic bacilli germinate in the soil, and they cite examples of cholera, typhus and other species of bacilli found at various depths and for various periods. With regard to typhoid fever and plague, the reader is referred to articles in our preceding number and repeatedly in preceding volumes, and with reference to yellow fever to the literature of the subject generally, but exceptionally to that of Charleston, S. C.,* for a twofold purpose: The frequent occurrence of yellow fever there during many years, while the undrained soil was loaded with putrescible matter and more or less constantly upturned regardless of season; and conversely, the non-recurrence of the disease during the last forty years while the soil has been drained. Manifestly with subsoil drainage every downpour of rain is a soil-cleansing process, the residue being carried off by the drains.

However, it should not be inferred from this citation that the sanitary conditions of Charleston are adequate against the introduction or possible eruption of yellow fever. The drains referred to are dilapidated, much filth has accumulated and is still accumulating in the soil, and efficient sewerage is an imminent need. There are many night soil pits and other filth storage recesses throughout the city, adding to the receptive conditions of the soil, while their foul emanations greatly add to sickness susceptibilities of all sorts.

It would be superfluous to the readers of the Sanitarian to here reiterate the natural history of yellow fever, so fully written and so frequently referred to in its pages during the last twenty-five years. Few diseases have been more thoroughly studied or so often described. It is conceded to be a disease of pathogenic germ origin, though *the* germ is still of questionable character. The conditions of its vitality, however, are sufficiently well known to justify the conclusion that, if dealt with intelligently, it will ere long cease to be tolerated in this country.

Koch and Duclaux tell us that pathogenic germs leave the earth in many ways to attack men and animals. The turning up of an undrained soil liberates pathogenic germs, and when the soil is not disturbed for a long time a colossal germination frequently goes on. Exhumation frees the bacteria latent in the soil, hence the epidemics that follow the upturning of fresh ground. The soil which adheres to the body, to the feet of animals, and that which is carried by insects disseminates pathogenic germs. Currents of air transport superficial dust, and so transport the spores which have resisted desiccation.

The two most potent means of destruction which pathogenic bacilli encounter are the saprophytic microbes and solar light. As before remarked, the saprophytic microbes are in continual strife with the pathogenic germs, and have generally the advantage.

Solar light alone is fatal to most bacilli, and, according to Duclaux, it is the most universal means of sanitation, and the most economical and potent to which public or private hygiene can have recourse.—The Sanitarian.

* Report of the Committee of the City Council of Charleston upon the epidemic of yellow fever of 1858.

"Ampelopsis Tricuspidata."

THE introduction of the Japanese ivy into this country was undoubtedly a boon. Like the country from which it comes, it is a wonderfully quick grower, and in American cities it has wrought great changes. In the rural regions it has not supplanted the native plant known to botanists as ampelopsis quinquefolia, and to plain people as Virginia creeper, over which the chief advantage of the imported article is its amazing rapidity. That increasing number of our fellow citizens, mainly women and children, who make a point of getting out of town before the middle of June and of not returning before the middle of September, do not know what a transformation is wrought during their absence in the summer aspect of the city. In many residential streets the house fronts disappear entirely behind a wall of green.

This is quite as it should be. The hiding of the New York brownstone front is undoubtedly a public benefaction, and if the Japanese ivy could be induced also to overgrow the sheet-metal cornices which surmount the brownstone fronts, that would be all the better. This is a public service which ampelopsis has not thus far shown itself capable of performing. But we ought to be grateful to it for concealing so much as it does conceal of the brownstone fronts. Its lustrous green goes very well indeed with the chocolate of the stone, and when it partly conceals and partly reveals the architectural "features" of the front, the spectator is at liberty to imagine them a good deal better than they are. Besides, the waving curtain of foliage is in itself an extremely grateful object, especially when the breeze strikes it and ruffles its surface into waves with crests of emerald light and hollows of opaque shadow.

But nevertheless ampelopsis has its abuses as well as its uses, and its abuses are coming to be as much in evidence as its uses. As a screen for bad architecture we have said that it leaves nothing to be desired, nor as an ornament to dead walls which have no architectural pretensions. One of the luckiest instances of its employment is on the old Reservoir at Forty-second Street, now doomed to demolition. The slope of rough masonry is not only effectively embanked and embowered, but the big Egyptian moldings that crown the wall are indicated, and almost emphasized, even while they are concealed. The architects of the Public Library will be very fortunate if they put in its stead anything so welcome to a sensitive passer-by as the aspect which the ivy-grown wall they are about to tear down presents at the end of the present season.

But other employments of ampelopsis are by no means all so lucky. Churches as well as houses in Fifth and Madison Avenues betray a belief that the vine cannot be overgrown, and it is used not merely and properly to emphasize the architecture, but also to hide it. And this is a misfortune when the architecture is good. There is one slim spire in upper Madison Avenue which is, so to speak, architecturally draped and with an excellent result. But the pretty little church at Sixty-sixth Street and that avenue is smothered, and needs a good deal of cutting out of the greenery to produce the best results. But perhaps the most injurious application of the plant is at Forty-third Street and Fifth Avenue, at the rear of the Temple Emanu-El. The temple, as we all know, is one of the prettiest things in New York, and perhaps the prettiest thing about it, excepting the picturesque front on the avenue, is the porch at the rear, with its admirable proportions and its graceful and delicate Moorish detail. Now, it is just this detail that the ampelopsis is being instigated to overrun, although there are expanses of rough wall alongside where ampelopsis would be entirely in order. Decidedly the growers of Japanese ivy on buildings of architectural interest ought to take architectural advice before they begin to overgrow these edifices.—New York Times.

Æsthetics in Bridge Design.

THE bars and plates that issue from the steel rolling mill, and which the bridge designer has to work into his structure, are modeled on purely utilitarian principles, and do not lend themselves readily to the attainment of beauty in a roof or bridge. And it may safely be said that the designer takes little or no thought as to how his structure will look to the casual observer, his chief aim being to make the work as light and inexpensive as possible consistently with the strength and rigidity that may be demanded. Hence it is that we have to witness so many hideous iron bridges that are planted in Europe as well as in America. To a professional eye there is undoubtedly a beauty in an iron structure that is finely proportioned, and there is no reason, except deficiency in the artistic sense, why a bridge should be made as ugly as possible. Mr. Oscar Sanne is evidently of this opinion, for in a paper recently read before the Western Society of Engineers he strongly advocates the development of a more ornamental design where circumstances and surroundings warrant such treatment. Let it be granted that we cannot make a bridge of iron or steel to look like a Greek temple, nor produce an endpost that can be compared with a Doric, or an intermediate post with an Ionic column; but we agree with Mr. Sanne's contention that any detail in a bridge can be worked in such a manner that, besides its fulfillment of all requirements as to strength and durability, it may make a pleasing and harmonious impression. In a correctly designed bridge or roof every single part has its absolute meaning, and serves always a certain purpose which even an unprofessional man will look at with a certain amount of satisfaction. Even if he should not be able to understand the reason why this or that detail had to be used, he feels at rest, and the structure gives him the impression of safety. Wherever this condition prevails, one of the first conditions of artistic design is fulfilled. There is generally a fear that any attempt to pay much attention to the æsthetic side in bridge design might increase the cost. It may do so in many cases, but not necessarily; and we think that the draughtsman who delineates a structure with all essentials as to safety, and at the same time keeps in view the effect its general elevation will have upon the artistic eye at some distance, is the man who shows the highest qualifications for his profession.

Public Ways and Parks in Silesia.

THE roads in Breslau are kept in good condition, says United States Consul C. W. Erdman, of Breslau. In fact, what is said to be the finest promenade of Europe surrounds the old city, beside a stream of water known as the "Stadtgraben," the former fortification ditch, which has been beautifully improved and which is about 200 feet wide. This is supplied with water from the river Oder, and is well stocked with fish, which are sold at auction by the city administration once a year and bring a good revenue, which is used to keep the promenade in repair.

The promenade is from 100 to 150 feet wide and about 12,000 feet long, and is well supplied with benches for seating purposes. The small parks of 400 to 1,000 feet square, through which the promenade runs, have flowers, fountains, etc. Numerous parks are scattered over the city. At intersections of streets small strips of land, from 200 to 1,000 feet square, are planted with fine shade trees and provided with benches.

There are also other parks which the city has made from abandoned graveyards, the law being that when a graveyard is full and has not been used for the term of forty years for burying purposes, it becomes a public park.* As they are planted with all kinds of shade trees, the abandoned graveyards make splendid parks at once.

The turnpikes through the province of Silesia are about 100 feet wide. Three-fourths of the width is macadamized, and one-fourth is natural dirt road. The roads are kept in a better condition than a good many macadamized streets that I have seen in the United States. A good reason for this is that the fellies and tires of the wheels are never less than two inches, and sometimes eight inches wide, and the gauge of all wagons, whether carriage, truck, or farm wagon, must be 1½ meters (4.92 feet). This law in regard to the width of the gauge and the tires of the wagons is strictly enforced. The fellies and tires of all farm wagons must not be less than four inches; of rock and heavy freight wagons, from six to eight inches.

The roads are kept in order by men who have charge of certain sections, under the supervision of the roadmaster. The man who keeps his section of the road in the best order during the year receives commendation from the roadmaster for performance of faithful service, which testimonial is looked upon by the laborer as a great honor.

On each side of the public roads are pathways for foot passengers, which are kept in good condition. Along the inside of the footways and outside of the road are trees, planted about thirty feet apart; most of them are black, white, and red cherry trees, of a very fine quality, and plum trees, known in the United States as the blue egg plum. These trees not only give excellent shade, but also return considerable revenue to the treasury of the various counties, the fruit being sold at auction so much per tree for a term of five years, the buyer binding himself to keep the trees well trimmed and free from insects, and whitewash the same in spring up to the first limb.

Stones are placed along the roadside, to keep the hubs of wagons from damaging the trees. The law against defacing or damaging any tree or shrub on the public highways is strictly enforced. As soon as caterpillars make their appearance, they are burned out with cotton balls saturated with coal oil.

There is no toll collected on any of the public roads, either for vehicles or foot passengers, excepting when a new bridge is constructed. Then a toll of 10 pfennigs (equal to 2.38 cents) per horse is collected, until the construction is paid for.

The roads and bridges are kept in repair by the county, which obtains revenue for this purpose from taxation of the realty adjoining the highway.

* Hebrew graveyards are private property, and can never be used for any other purpose, unless the city should extend any of its public ways through said graveyard. The portion taken for this purpose is condemned by a jury, and the trustees are paid by the city.

A STABLE AT BELLE HAVEN, CONN.

WE present, on page 52, in this issue, a very attractive stable and carriage house, which has been erected for E. W. Russell, Esq , at Belle Haven, Conn. The building is designed in harmony with the residence of Mr. Russell, which we illustrate on pages 41, 50, 51 in this issue. The building is erected upon a stone foundation. The superstructure, of wood, is covered with shingles and stained a dark brown color. The trimmings are painted white. The gables are beamed and plastered, the beams being painted a dark brown in harmony with the body color. The roof is covered with shingles and stained a dark green. Dimensions: Front, 32 ft.; side, 48 ft., not including carriage wash, which is covered over by the graceful fall of the roof. The interior arrangement is most complete. The walls and ceilings throughout the first story are ceiled up with hard pine finished natural with hard oil. The carriage-room is well fitted up with harness closets, with ornamental iron fixtures and sliding glass doors. The stable contains five single stalls and one box-stall, fitted up with the usual iron fixtures. Stairs at the side lead up to the second floor, which contains the coachman's rooms, consisting of one large living-room, kitchen, and bedroom, and also hay-loft and feed-box. Mr. C. P. H. Gilbert, architect, 1123 Broadway, New York city, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

Weighing of Tall Buildings.

THE city of the future will be built upon solid rock. Modern conditions point that way. The solid rock may not necessarily exist at the surface of the earth. If it does, so much the better. If it is deep underground, the foundations of buildings will have to be carried down to it. The latter day sky-scraper and the practice of building houses of the very heaviest materials render this compulsory even now. There are men in New York and other large cities whose sole business it is to test the character of the ground on which tall buildings are to stand. They are experts, and no thorough-going architect would trust to his own discernment in the matter of his groundwork. In fact, the construction of sky-scrapers has vastly extended the calling of the architect, and compelled him to do some things of which the constructor of bygone days never dreamed. Most interesting of these newly acquired habits is the weighing of tall buildings.

WHY SKY-SCRAPERS ARE WEIGHED.

The average person might not fully appreciate the necessity for weighing a tall building. In fact, many people would calmly assert that it could not be done, yet the practice of weighing immense buildings, bridges, heavy ordnance, and ponderous objects generally, is a science in itself. It is all done by computation, but the actual weight of the structures is accurately computed. In heavy ordnance not only is the weight computed without putting the gun on a scales, but the center of gravity is determined within such a fine point that when hung on its trunnions the gun is so nicely balanced that it can be moved up and down by the hand of one man. Swinging bridges, which move upon a pivot, so to speak, are so accurately balanced that hardly a pound of difference exists between the two outstretched arms.

It is necessary for an architect to know the weight of his building long before it is put up. The character of his foundation depends upon it. Yet the estimation of this weight is so simple a matter that an under clerk or an apprentice in an architect's office is often given the task of calculating it. His grand total may reach, as in the case of the twenty-one story Surety building in New York, 50,000 tons, or in the case of some big bridges like the one at Poughkeepsie, 4,000 or 5,000 tons. He will reach it, however, to within a few pounds, and he will also be able to say just where certain heavy parts of the load strain will be most felt. How is it done? In the first place, the weight of every piece of material which is to become part of the structure is furnished by the manufacturers. Whether it be Z-bar girders or white lead, it is all brought into the total. Even such an insignificant thing as a difference in the quality and kind of paint used may make a ton of difference in the general weight of the structures. Every rivet in the building is accounted for, and if the ends are fused (hammered down on the opposite side of a girder instead of being merely bolted on) the fact must be taken into account. If the roof is covered with tin, the solder which holds the plates together is put down as weighing so much per ingot. In laying the tin plates on the roof the edges of each plate are lapped over the adjoining plates to the extent of a quarter of an inch on all sides. This quarter-inch of necessary lap adds a large number of pounds to the general weight of the roof. So the process continues through the whole building. The weights of the clapboards, the plaster, the wall paper, the window glass, the gas or electric fixtures, the cornice ornaments, and of the thousand and one materials and appurtenances which go to make up a building are considered and accounted for. In the aggregate those weights, summing up in the thousand tons, constitute merely the dead weight of the building. The live weight, such as the weight of the tenants, the furniture and their other belongings, must be added to the sum total.

WEIGHT OF TENANTS CONSIDERED.

An office building with a capacity of 3,000 persons would be about 165 tons lighter at night when it is deserted than in the daytime when it is occupied. In office buildings it is customary to estimate about 100 pounds of live weight to the square foot. In residences about 70 pounds to the square foot is calculated upon. In manufacturing establishments it is customary to allow for at least 150 pounds to the square foot. The buildings themselves press down upon the earth at the various rates of from four tons to the square foot to 12 or 14 tons to the square foot. The tall St. Paul building in New York is estimated at the latter figure. The Surety building mentioned above is estimated to exert a pressure of six tons to the square foot.

A curious part of this business is the testing of the ground on which tall buildings are to stand. Nearly every tester has his own method of ascertaining earth resistance. Some do it by hydraulic pressure, some by pile driving, some by driving down into the earth a "worm" which picks up dirt and gravel and sand at various distances and conveys them to the surface to be examined. The hydraulic method is pursued by constructing a box or casing, which is fastened tightly to the ground. In it a plunger, operated by water pressure, is made to press down upon the earth. The force with which it presses on the ground is determined by its resistance to the inflow of the water which is ascertained beforehand. In driving piles, they are simply forced down until they will go no farther. This is done at various points over the ground on which the forthcoming structure is to be built. Of course, the depth of this point of greatest resistance can be marked off on the beam of wood which has gone down. The worm resembles a corkscrew. It is hollow, and as it twists its way down through the earth the various strata of the latter are forced up through the screw in the order in which they are encountered. A perfect record of the condition of the ground, with the depths of the various substances unearthed, is obtained. For very large steel buildings, however, it is necessary and safer to rest the foundations on solid rocks.

MAKING ARTIFICIAL ROCK.

This is done by sinking caisson hollow tubes, which are forced or screwed down through the various clays and gravel to hardpan. When these hollow steel tubes strike the rock they are firmly secured to it. Then they are filled with concrete. The latter hardens into rock, which is rendered all the stronger by its steel coating, and the whole affair becomes a pillar of rock, sheathed with steel, and extending from the immovable backbone of the earth itself to the surface. The modern sky-scraper may then be said in many cases to stand upon stilts. Nothing can perceptibly alter its solidity—not even the wind, the swaying power of which can not compete against the truss formation of the structure itself. There is one power which does at times arrest the stability of the sky-scraper. This is the sun. The immense amount of iron in the structures is acted upon, and to a certain extent expanded and contracted as the rays of the orb of day change their direction, but not enough to cause any fear of disaster. In bridges, however, this expansion and contraction are very marked. In a concrete floored bridge the whole structure will bend backward and forward as the day passes to the extent of one-quarter of an inch, but in an iron bridge such as are used by railroads the "draw" may go several inches out of plumb. This is the reason that on draw bridges the railroad tracks are connected by flaring tracks, or what is technically known as a Y.

FOUNDATIONS NEED GREATEST CARE.

In tall buildings the greatest amount of engineering skill is required in the foundations. The building itself is, after all, a superstructure. It is the foundation that requires the engineer's greatest skill, for sometimes the conditions are most adverse. For instance, in lower New York water is encountered at very shallow depths, and it is in this lower section that most of the sky-scrapers are built. The Commercial Club building is eighteen stories high. Its foundation floor is 18 feet below the surface water level, and at least 10 feet below river level. Yet the lowest subcellars are, so to speak, as dry as punk. It was accomplished by means of the intricate and extended caisson system. The water is entirely excluded. When such low levels are reached, the contractor has really as much to do in preserving the integrity of the surrounding buildings and streets as he has in economically carrying on his excavations. The laws are very stringent in regard to a cave-in, and municipal law suits are sure to drain one's pockets. In some places, however, in spite of the most extended "shoring up," there is sure to be a curve in the nearby street lines. Recently in New York, at a deep excavation, a person could, by going some distance up, gaze along the car tracks and discern part of an immense quadrant, formed by the tracks where they had followed the sinking of the ground toward the excavation.

Why does not a big building topple over? is the question asked by the observer. It would seem that the action of the winds, rain, sun, and elements generally ought to cause it to fall. It could not fall, for several reasons. In the first place, every part of the structure is bolted to the adjoining parts by means of steel rivets, which are inserted red hot, and which, as they cool, draw the various pieces of steel together with a force that almost accomplishes molecular adhesion. The building thus becomes a unit above ground. Below ground, as has been pointed out, the caisson system of construction admits of no disintegration. On the other hand, the line inside of which the center of gravity exists lies so far outside the building that it could not possibly topple. The basement construction is such that the whole affair resembles a telegraph pole, which would first have to get out of its hole in the ground before it could fall. The same conditions exist in turnstile bridges. The base or pivot on which the bridge turns is so broad that the outstretched arms could not possibly tilt the whole structure. In the new Third Avenue bridges in New York city each arm extends out 120 feet beyond the central turnstile. In order to topple, sufficient weight would need to be placed on one arm to overcome the weight of the other arm and the heavy central base. As the bridge weighs, all told, nearly 3,000 tons, this would be practically impossible.

WEIGHING BY COMPUTATION.

A piece of heavy ordnance is hung on its trunnions merely by calculation. The center of gravity is needed, of course. The center of gravity of every part of the gun is calculated first. Then the relation of these centers to the general center is ascertained by computation. Engineers are able to determine it within a small fraction of an inch. In short, the weighing of ponderous objects is part of a special science—the science of extremely delicate computation.—Theodore Waters, in Southern Architect.

Bad Plumbing—Smoke Test Experiences.

SOME time since I was appointed by the board of health of a neighboring city to make the smoke tests required when the examination of the plumbing system in a building was necessary, and the work has led to some very peculiar experiences and cold receptions, which finally resulted in friendship with the occupants of the building, and in many instances in profitable trade. In one case on applying at the house and informing the servant what was desired, I received word from the mistress to go away, as no order had been given for me to do any testing.

I went to the officer of the board of health and reported my experience, and he returned with me to the building, but we were unsuccessful in gaining admission until the policeman was called, and then our explanation secured us the opportunity to make the test. When the system was filled with smoke, leaks were found in the cellar, the kitchen, and the bathroom. I then requested the servant to inform the lady of the house, and on her appearance explained to her what I had found, when she accompanied me to each of the leaks, and on understanding for the first time the use of the various pipes and the effect of leaks in them, I was given the order to make everything right. This was done in due time, and after the work was completed I made another smoke test, without difficulty in gaining entrance to the house, and had for an interested spectator the mistress of the house, who searched as diligently as I did to find any possible leaks, and I was not more gratified than she to know that the work was absolutely tight.

In another instance the doctor attending a case of fever requested me to make a test of the plumbing in the building, and here again the privilege was refused, and the request of the doctor in person with me afterward was unavailing, until an application to the board of health was made for an order, when, accompanied by a constable, and much to the disgust of the house owner, the test was made. Adjoining the chamber in which the fever patient was confined was the bathroom, and the soil stack in the building ran up in a corner formed by the wall partition, so that gas escaping through any breaks in the joints below might readily pass up around the pipe and find its way through openings in the woodwork and plaster into the chamber. Upon applying the smoke test smoke entered the sick chamber and the bathroom in equal quantities, while a leak at the floor connection of the water closet was also discovered. The soil stack was found to have two badly split hubs exposed in the basement, and on having the lady of the house examine these defects while the smoke was issuing from them, and explaining the uses of the pipes, and with the doctor's assistance the dangers arising from leakage, I again received orders to make repairs, and after completing them another test was made, showing the system to be in good condition.

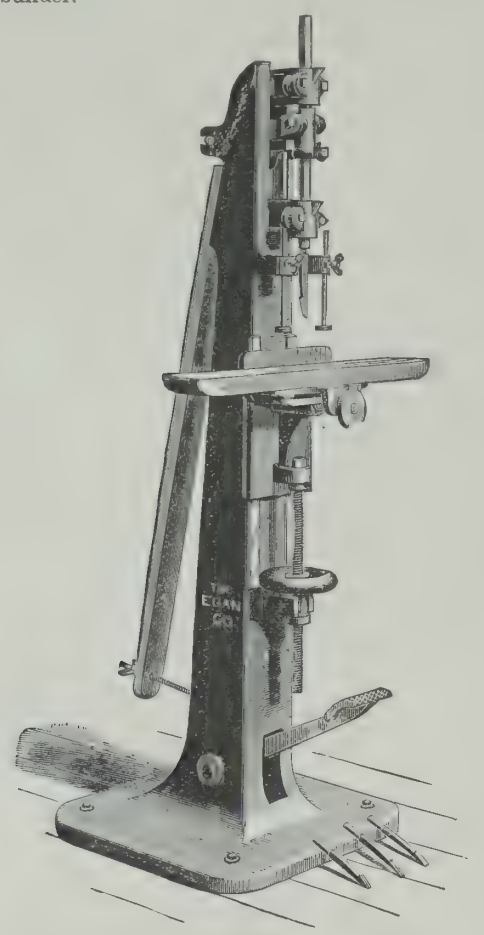
Although this town is a short drive from my shop, through these two particular smoke tests I have secured a great deal of plumbing work, and have men working there as regularly as in the town where my shop is located. I would point out that in both of these instances the reception I had was particularly exasperating, and had I not controlled my temper and pursued an intelligent course I should have incurred their enmity and lost the increase in business that has resulted. I am of the opinion that if anybody will make a specialty of the smoke test, using in connection with it an abundance of patience and good nature, and carefully explaining to customers the condition of their plumbing systems, it cannot but result as it has in my case—in profit to those who try it.—By P. R., in the Metal Worker.

ORNAMENTAL sheet metal work is rapidly finding favor in some of the newer countries that are being added to the foreign markets of the United States. It has much in its favor. It is artistic and durable. In tropical countries it cannot be destroyed by the white ant and other wood-eating insects. It is less dangerous in earthquake shocks. It cannot be set fire to by a solar ray or a match. In its embossed form it can be made a pleasure to the eye. It is light of weight and easily manipulated, and for these and other reasons it would seem that its future as a commercial commodity is practically assured. Is there any limit to the possible uses of iron and steel, as time reveals their merits and ingenuity suggests their services?

TO ASCERTAIN whether lumber is dry and sound, hold the ear to one end of the beam and have some one knock on the other end with a key. If the wood is all right, the knock can be heard distinctly, even if the beam is thirty yards long.—Maler Zeitung.

A NEW FOOT POWER MORTISER.

THE foot power mortiser illustrated is made after entirely new designs and patterns, and is especially adapted to the requirements of builders and carpenters who do not employ power, but must have a trustworthy foot-mortiser in their shops. It is claimed that this machine is more powerful than any other yet introduced. Its construction has been simplified in such a way that it should meet with a hearty reception from the carpenter and builder.



PATENT FOOT POWER MORTISER.

The frame is cast in one piece, the base being very broad, making a good, solid support, so that the machine is not likely to tip or move when in operation.

The chisel mandrel is operated from the treadle below; the mechanism of this part is arranged in such a way that strength and leverage are obtained with little strain on the working parts.

The table has both a vertical and a horizontal adjustment, and is raised and lowered by a hand-wheel beneath. The ways, on which the table is raised and lowered in gibbed dove-tailed slides, are cast on the frame, and make a solid bearing. Any wear on these parts can be instantly compensated for.

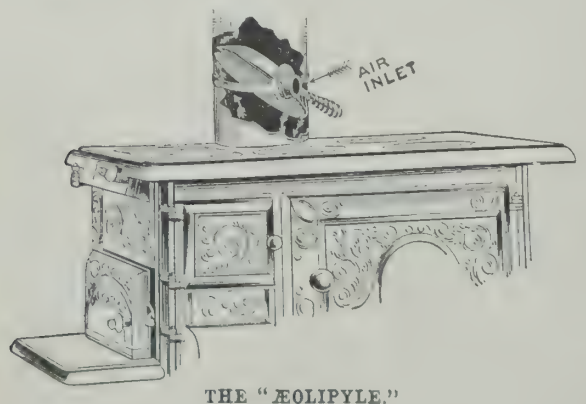
The spring is of ash, and is arranged in such a manner that it will be found superior to most arrangements now in use; it will not crack by changes in the weather.

Chisels of any size can be used. A blind-chisel for blind-slats can also be supplied; this is furnished with three pairs of bits—1¼, 1½, and 1¾", which are oval-shaped and work in a superior manner. The machine also has a sash tenon-chisel which will be found a great convenience.

The builders of this new and advanced type of machine are The Egan Company, Nos. 209 to 229 West Front Street, Cincinnati, Ohio.

THE "ÆOLIPYLE."

THE "Æolipyle" is an ingenious device made by the Æolipyle Company, of 117 Beekman Street, New York city, and adapted for use on stoves and ranges. The "Æolipyle," it is claimed, will save at least twenty-five



THE "ÆOLIPYLE."

per cent. of the coal; will increase the heat by burning the gas instead of conducting it to the chimney; will provide a better draft; will keep the oven always hot, as well as the water in the boiler; and will dispense with the necessity of shaking the grate, as the fire does not depend on the air passing through the grate. No sifting of ashes is necessary, as no unburned coal passes through the grate.

A New Japanese Palace.

THE Tribune of recent date reports an interview with the architect of the Imperial household, Japan, who is here to buy steel to be used in the framework of the new palace for the Crown Prince Yoshihito. His name is Tokuna Katayama, and he told some of his plans to a Tribune reporter at the Hotel Imperial.

"The new palace," he said, "will be one of the finest, if not the finest structure in Japan. It will cost between $2,000,000 and $3,000,000, and will take six or seven years in building. In no country are buildings thrown up with such astonishing rapidity as in America. In Japan we require more time, but the building of the palace will be unusually slow, because of the intricate work to be put on it.

"It will be in the Italian Renaissance style, and in the decorations I shall endeavor to combine what is best of Japanese art, and of European and American art as well. It is likely that we shall import some carvers from America, but it is too soon to discuss that subject, for the building will not be ready for decoration for several years. I do not know, as yet, the amount of steel I shall have to buy. I notice that the price of steel is steadily rising, and I am afraid that my purchases here may run up as high as $300,000. As soon as the material for the framework arrives, work on the palace will be begun.

"Architecture in Japan is in a transitionary stage. The old wooden dwellings are unsatisfactory for many reasons, chiefly because they burn like tinder boxes. The ordinary brick building is even more undesirable, because the first hard earthquake shock will send it tumbling down upon the heads of its occupants. When you consider that Japan has, on an average, about three hundred earthquakes, of more or less violence, in a year, this is not an unreasonable objection. The steel frames, however, have solved the problem. Japanese houses in the future will have steel frames, and the walls may then be built of brick or stone with perfect safety. But the height must be limited. I should say that no building over four stories high, even though it had steel framework, would be safe in Japan. The palace of the Crown Prince will be only two stories. In the matter of architecture Tokio or Yokohama can never be like New York. They may be as wide and as long, but not as thick. There is a tendency in Japan to adopt the American architecture as far as possible. It varies so widely that monotony has no chance to creep in.

"I think the next class of buildings to undergo a change will be the railroad stations. At present they are almost invariably of the old wooden shanty style. We have none of the fine train sheds, with great steel arches, that you have in America, but I think the time is coming when we will. I predict that the next few years will witness a wonderful revolution in Japanese architecture."

Percolation through Brick and Stone.

THE results of some experiments to ascertain the most effective material for checking the percolation of water through brick or stone work are given by Mr. A. W. Hale in a recent number of the Engineering and Mining Journal. The investigation was mainly carried out in connection with the new Croton aqueduct of New York, and the substances employed in the experiments were numerous and varied. It was found that Portland cement gave the best results, and that the hydrocarbons, which are commonly regarded as suitable materials for rendering brick or stone impervious to water, oxidized by exposure to air and gradually disappeared. It was also found that a brick was rendered impervious to water by cement more rapidly when the cement was applied as a wash by means of a brush than when applied with a trowel in the usual manner. A brick which had been treated with four cement washes was found at the expiration of two months to be quite impervious to water, even under a pressure of 200 pounds per square inch.—The Builder.

Shingle Roofs for Russia.

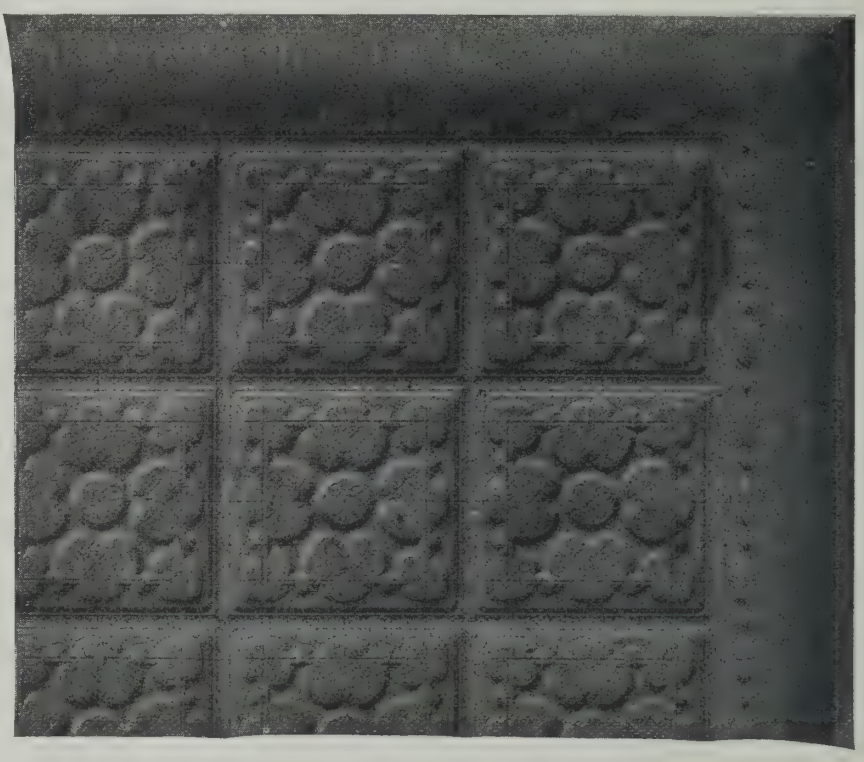
IN view of the terrible loss sustained in Russia every year through accidental fires in the villages, efforts are being made by the government to induce the peasantry to employ some less dangerous material than straw thatch for the roofing of their izbas. For some time past there has been a considerable increase in the use of "shingles" in the place of thatch, with the object of diminishing the risk of fire; and this, in its turn, has led to a very large importation from Germany and Belgium, and more recently from the United States, of simple and inexpensive shingle-making machines for use in rural districts. Shingle must be made in the district in which it is to be used, as it would not pay for distant transport in Russia, and this necessitates the use of a very large number of small machines. German machine manufacturers, whose "Commercial Intelligence Department" is remarkably well informed, are now making redoubled efforts to meet the immense demand anticipated. An improved and inexpensive hand fire-engine is also being provided. The employment of shingles for roofing in the manner generally adopted in Russia entails the use also of roofing felt or paper. Nearly the whole of this is imported from abroad, and the demand is constantly increasing.—London Saturday Review.

KANNEBERG STAMPED STEEL CEILINGS.

THE stamped steel ceilings made by the Kanneberg Roofing Company, of Canton, Ohio, are suitable for all classes and styles of buildings. That they are artistic in design, a glance at the accompanying illustration will prove.

Stamped steel ceilings are durable, require no repairs, do not drop off from jar or settling of the building; and will not warp, crack, burn, or absorb infectious germs.

In the manufacture of their ceilings the company exercise great care. The plates, after being stamped, are resheared on all sides, so that they will line perfectly. As they are interchangeable, they will permit a variety of pleasing combinations. The joints, fitting closely and accurately, are water-proof, and require no labor or expense in puttying.



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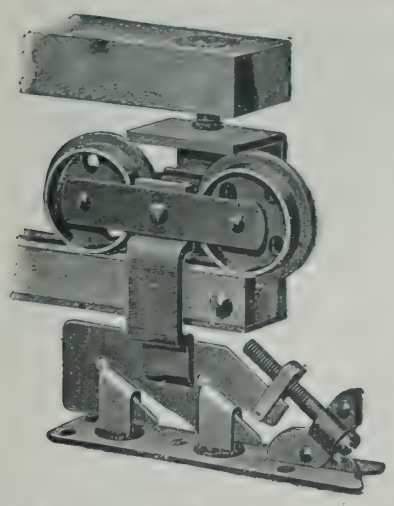

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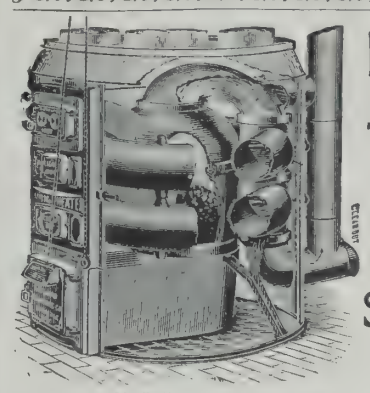

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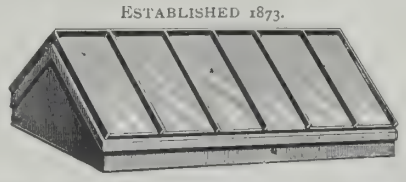

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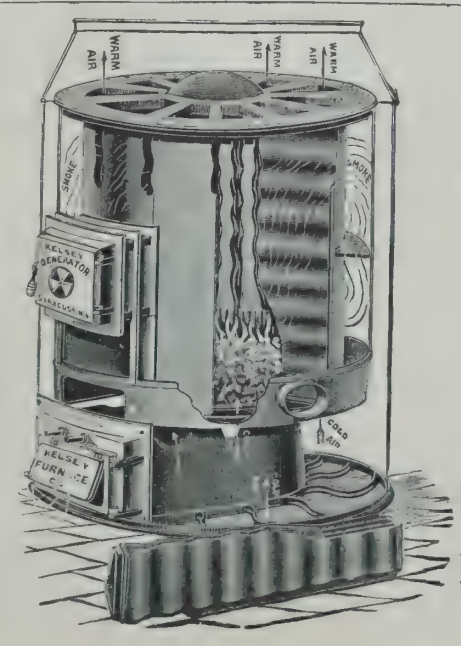

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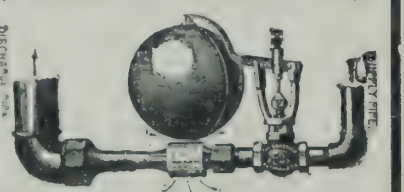

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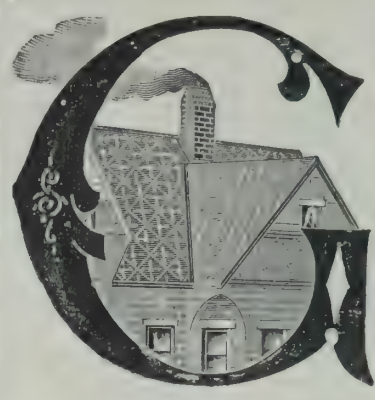

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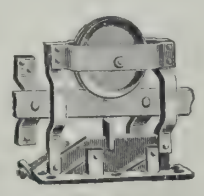

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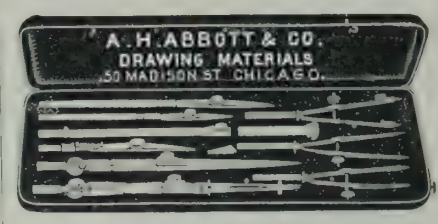

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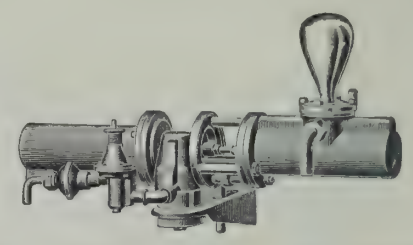

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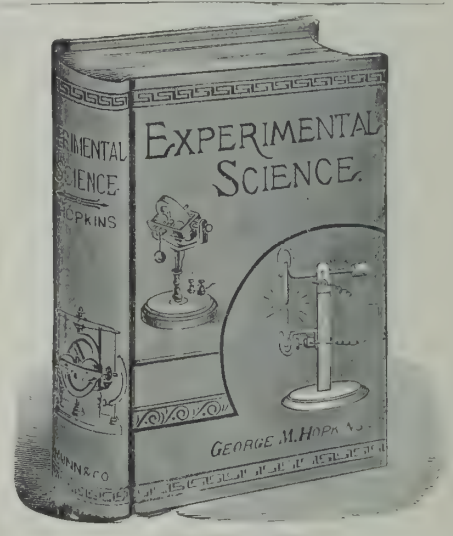

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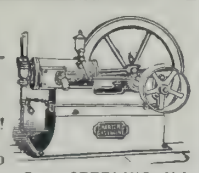

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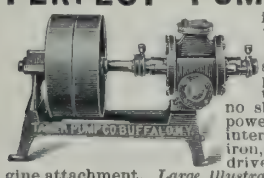

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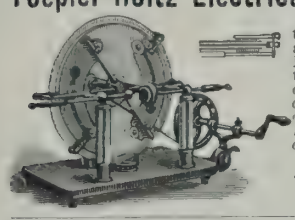

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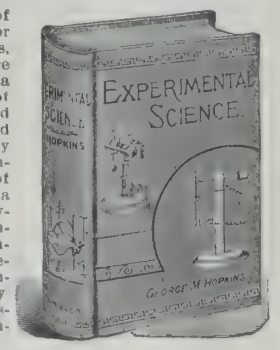

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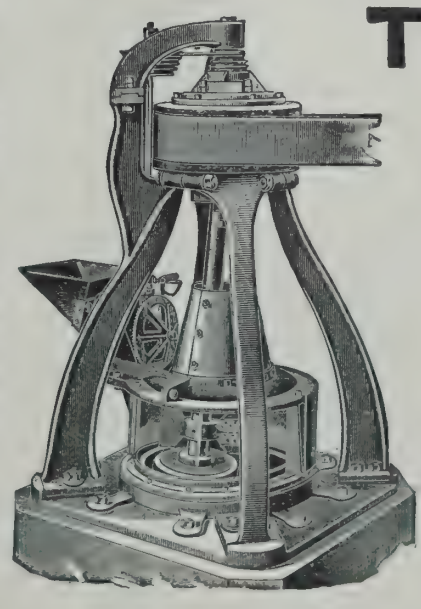

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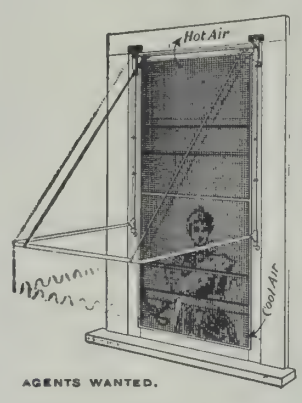

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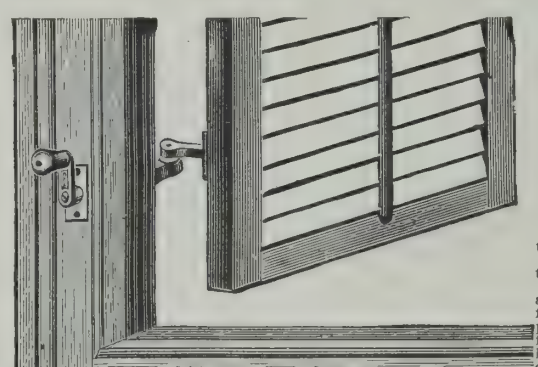

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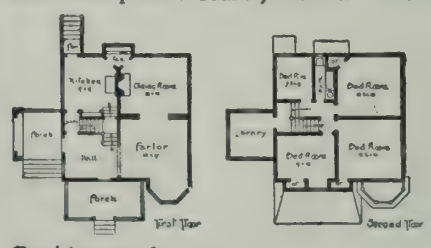

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F. WELLINGTON RUCKSTUHL'S "WISDOM," FOR THE NEW APPELLATE COURTS BUILDING.—See page 62.

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AMERICAN ARCHITECTURE FROM A GERMAN POINT OF VIEW.

UNTIL a few years ago it was regarded as almost an axiom in Germany that, although sadly lacking in artistic features, American architecture was worthy of consideration from the constructive and practical point of view. Now, however, all this has gradually changed, and Herr Leopold Gmelin, the editor of "Kunst und Handwerk," has written an article, entitled "American Architecture from a German Point of View," which is published in "The Forum" for August, and by permission of the publishers we are enabled to present a résumé of this important article.

Herr Gmelin says that at the beginning of the eighties, illustrations were occasionally submitted to him, presumably as editor of the beautiful journal which he conducts. The dwellings were unique and original in character, and at once excited a deep interest. They were in wholesome contrast to the former rigid and purely utilitarian form, due to a more harmonious grouping of the several parts. He says, "the improved condition of architecture in the United States since the close of the last decade has created a complete revolution in German professional architects regarding the status of America in this branch of art. This revolution is in a great measure due to the fact that since 1882 a technical specialist has been attached to the German Embassy at Washington, and the public reports of this expert have undoubtedly tended largely to direct the attention of technical circles in Germany to American architectural art. A still more powerful factor, however, was the opportunity for personal observation afforded by the Columbian Exposition." He is of the opinion that the numerous foreign architects who visited the World's Fair must have gained the impression that the United States was capable of producing, not only good, practical builders, but thoroughly artistic architects as well. Upon their return they were forced to the recognition that America afforded a fruitful soil for the development of architecture; that, in fact, the evidence of the growth which had already appeared gave promise of a brilliant future, and constituted a phenomenon worthy of serious consideration. The careful attention with which the achievements of American architects were followed is shown by Paul Graef's "Neubauten in Nordamerika," which we have already reviewed on a number of occasions. This work deals with various phases of American architecture, and illustrates the most important buildings in the United States. The influence of such publications upon the development of German art has been noticeable for some time, more particularly as regards private dwellings, and many German architects whose studies were formerly confined to the ancient buildings of Germany, France, Italy, and Spain, now find it expedient to devote a few months to the study of the best modern productions of art in America. He says: "Prior to 1873, a trip to America for the purpose of architectural study would have been considered positively ridiculous. To-day such a trip is regarded in an entirely different light, and whoever has beheld the American architect at his cheerful labor can understand the enthusiasm with which our German colleagues recommend a visit to the United States." It is easy to appreciate the German critic's views on the subject of the older American architects. It is to the period he names that we owe the characterless rows of brownstone houses which form so conspicuous a feature of many of our Eastern cities. He calls attention to the fact that the architectural phenomena of a city like Chicago are as strikingly characteristic of modern times as certain well preserved districts of Nuremberg, Hildesheim, and Augsburg, and an architectural comparison of Chicago and Hildesheim would at once reveal a difference between modern and mediæval modes of life. He then deals with the planning of our American cities.

Of all architectural impressions received by visitors to North America, that produced by the colossal building, the "skyscraper," is probably the most profound. Herr Gmelin says: "We may rejoice in this fact or deplore it accordingly as we incline to the mediæval or to the modern ideal of life; but the fact remains that we have before us incontrovertible evidence of a most important cultural development." He regrets that, owing to the enormous value of land, American architects are rarely permitted to give full scope to their ideas and to erect buildings upon a grand artistic scale—buildings such as may be found in nearly every large city in Europe. He says that the "White City" of Chicago in 1893 shows that our architects are not lacking in the sense of the beautiful and the talent for arranging a group of buildings. In America we have no mediæval relics of military defense, so that our suburbs are not separated by any barrier from the city proper, but in the suburbs there is a reaction against the extremely dense aggregation of buildings in the business quarter, so that a little way out we frequently find houses only two stories high scattered in such a way as to suggest a pleasant communion with surrounding nature. In American cities private dwellings may be said to constitute the rule among certain classes in society, but in Germany such houses have long been classed among the exception. In Munich as early as the sixteenth century, the apartment house had already come into general use. Herr Gmelin condemns the "Putzbau" plaster finish which is used on so many houses in Germany. As long as this mode of decoration serves its legitimate character and remains within bounds, it is perfectly justifiable, and is as little to be condemned as the use of plaster for the inner walls, but as soon as this mode of construction transcends its proper limits and aims at an imitation of stone vaults with fancy mouldings, pilasters, pillars, etc., it must be regarded as an imposition deserving of our strongest condemnation. The absence of such spurious decoration strikes the observer as one of the most favorable features of American architecture. He does not altogether approve of the ordinary wooden house with clapboards and shingles, owing to danger from fire, but this is largely counteracted by our excellent fire department. He says, as regards the country house, however, more particularly when somewhat isolated, the employment of wood may receive our fullest sanction, and it is the generous use of this material that has enabled American architects to reveal the originality of their conceptions in the rural villas of almost infinite variety which dot the American continent. He considers that in the technical mastery of freestone the American architect stands unexcelled, and that the employment of terra cotta is due not solely to its susceptibility to artistic treatment; it recommends itself primarily by reason of its cheapness, its durability, and its fireproof character.

The German architect, in visiting American cities, is at once struck by the unmistakable European origin of the buildings; and yet their aspect to him is, at first, somewhat foreign, if not repellent. Thoroughly conversant with all the historic styles, familiar with all the laws of construction governing the architecture of former times, and extremely susceptible to every infringement of these laws, the foreign architect at first experiences considerable difficulty in familiarizing himself with the views of his American colleagues. When, however, he examines into the conditions under which American architecture is developed, he gradually learns to appreciate the splendid results already achieved in the New World. Indeed, his appreciation in many cases culminates in genuine enthusiasm. "As soon as we have divested ourselves of our prejudices in favor of that academic severity of style enjoined upon us by our European training, and begin to study American architecture, its external appearance, and the conditions which have affected its development, we become conscious of the fact that the American architect is truly inspired from within, and is endeavoring to give a fitting and harmonious outward expression to well-defined artistic ideas!" Where traditional styles are employed they are liberally construed and so modified as to present a new and harmonious entity. The mastery of well known historic forms is a recent acquisition, and a survey of the buildings erected prior to 1870 at once reveals those unfortunate architectural aberrations, consisting of a more or less perfect façade, supplemented by rows of pillars, turrets and similar ornaments. Despite occasional deviations and excesses, we may everywhere discern a healthy development from this and a correct application of means to the required end. It is under these conditions alone that a sound development of architecture can be secured. Mr. Hinkelduyn, who for several years was connected as technical attaché with the German Embassy at Washington, designates American architecture as a happy union between internal utility and external effectiveness—making a union observable throughout every gradation of style, from the simple and naïve to the dignified and the grand.

AMERICAN PAINTING AND SCULPTURE IN RELATION TO ARCHITECTURE.

NEW YORK is at last fortunate in having a public building which will be adequately decorated with appropriate mural painting and sculpture, and now a whole group of the men who made American painting and sculpture what it is to-day are engaged in completing the decorations of the new Appellate Courts Building in Madison Square. Too often in buildings of this nature money is frittered away upon garish marble and heavy, unmeaning mouldings and balustrades, but the leaven of the Boston Library and the Congressional Library is now bearing fruit, and the result is that in future the architect will call to his assistance workers in the sister arts to beautify his structures. Besides adding greatly to the appearance of the building and educating the public taste, it encourages art workers in the most practical way. Nearly all great painting is for the decoration of a wall or dome. The old masters recognized this fact, but it was not until a few years ago that it became recognized in this country, and it was not until the Chicago Exposition that people of culture really began to appreciate it, and the result is that the best men have had large commissions. Twenty years ago, when we had ceilings to paint, we sent over for third or fourth rate Italian painters who "decorate" houses with atrocious daubs, while at the same time the painter of easel pictures, with unshorn locks and velvet coat, earned a competence grinding out inane creations. But *autres temps autres mœurs*, and now the painter of easel pictures wants to know how to do this decorative painting which is so lucrative. It is a splendid example of what can be accomplished by a little band of carefully trained men who make opportunities and have taken commissions for next to nothing to demonstrate their ideas. Now no club or other building of any importance is complete without a work by some well known man, and even a great lighting company in New York has seen fit to have its offices decorated with a series of panels, the subjects relating to electricity. Clients have shown a disposition to employ only the best talent available, and leaving the work entirely to the artists. Architects now ask for this or that painter's opinion as to certain rooms in a club or private house, where a few years ago he would have relied solely on his own judgment or on some store "decorator."

In sculpture, as in painting, there has been a Renaissance. The dean of the sculptors is not such an old man, and Augustus St. Gaudens, Daniel Chester French, Frederick MacMonnies, Herbert Adams, F. W. Ruckstuhl and others, all produce works which, while their spirit is American, are at the same time cosmopolitan and progressive. A few years ago their efforts would have been unappreciated; the public called for bisque figures, small "groups" cast in some plastic material, and colored in dark monochrome until all semblance of life was taken out of them. To-day how different! We purchase plaster casts and put them in our houses, irrespective of their money value; we let them plainly show that they are plaster, and we are not ashamed of it. The days when people bought cast-iron deer for the front lawn are unfortunately not quite over, but people of taste and means are now using sculpture for the adornments of their gardens, and a beautiful marble "Hermes" on a pedestal does not cost a fortune, and confers distinction on the simplest garden. There are plenty of young sculptors who would be glad to model a simple sun dial or a "Hermes" for a hundred dollars, and it is only the question of a few years when capable men will be earning fair rewards by their chisel, even though they may not belong to the band of the great sculptors. The gradual improvement in public taste following the exhibitions of the Architectural League and the National Sculpture Society has been very marked.

The whole subject is a most interesting one, and the outlook for American art on the threshold of the new century is a most hopeful one, and we can all play a part in this development, even if a minor one, by trying to influence governing bodies in having every new structure properly decorated. If a court room in a small country town is to be done over, the walls may at least be harmoniously colored, even though five thousand dollars are not spent for a panel by a well-known painter. It is not always the expense which tells. There are many men with a love for the subject who would sit down and write a letter of advice to any serious inquirer as to what could be done with a specified amount of money.

RUCKSTUHL'S "WISDOM."

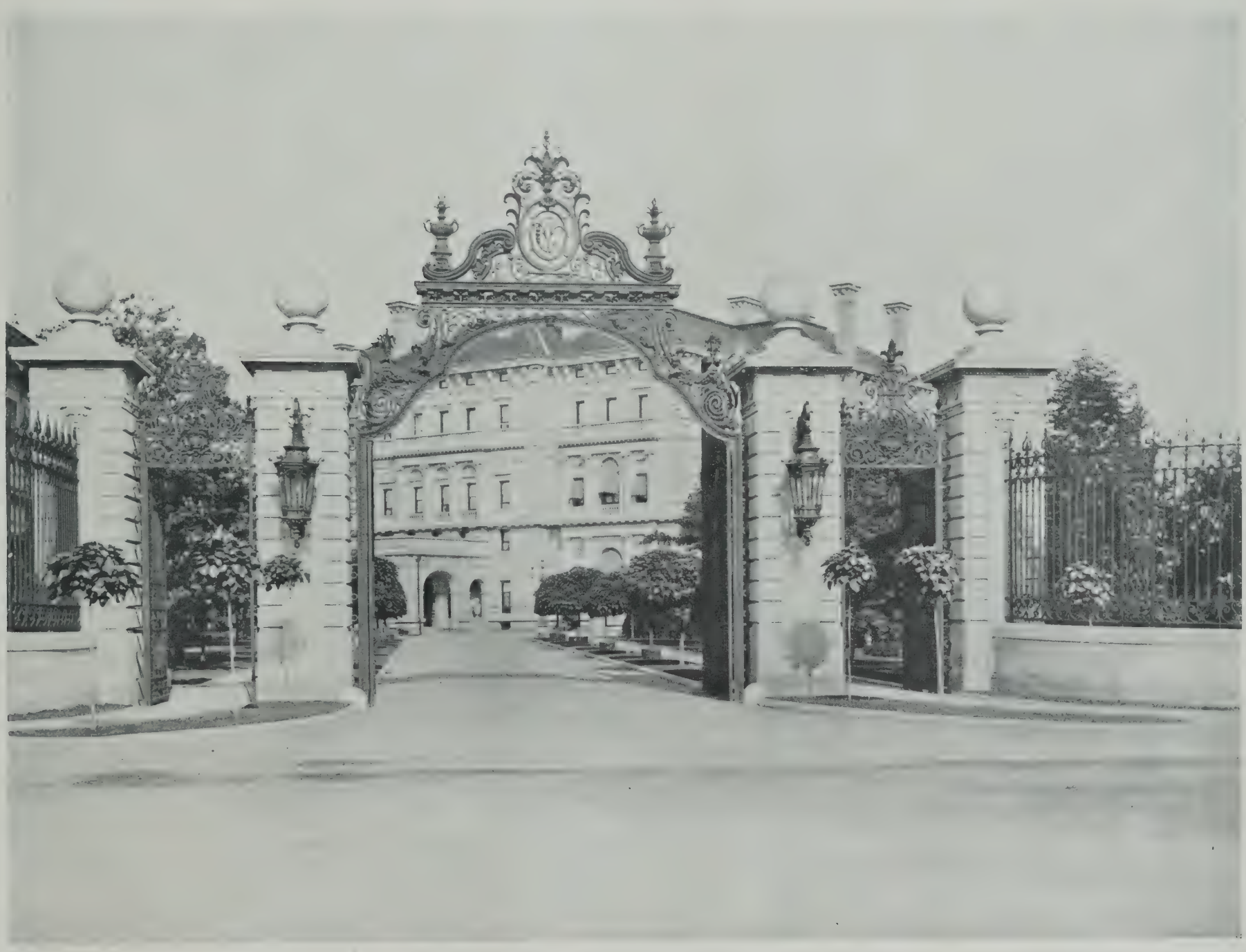
THE architect of the Appellate Courts Building, New York City, Mr. James Brown Lord, has done a very commendable thing in inducing the powers that be to grant a sufficient sum to adequately decorate the new building with painting and sculpture by the foremost artists of

America. It will at once take its place with those treasure houses of art, the Boston and Congressional Libraries. The men of the brush and chisel are now rapidly bringing to completion their works, and the structure itself will soon be ready to receive them. Sculpture is to be used to accentuate certain parts of the building, such as the entrance, and one of the most prominent statues will be F. Wellington Ruckstuhl's "Wisdom," illustrated on page 61, which will at once show that within Law is administered. Opposite to it will be "Force," the two admirably indicating in a symbolical manner that the behests of the Law, dictated by "Wisdom," must be carried out by the strong arm of "Force." An old man of firm but kindly mien sits on a richly sculptured throne or bench, and is meditating after poring over the great tome which lies in his lap. He is dressed in flowing robes or a toga, and a part of the mantle is thrown over his head, the whole resulting in an admirably-proportioned composition. The deep-set eyes look out upon the searcher for truth; there is no violent gesticulation, but the impressive figure seems to point out some passage in the Book of Laws which he is expounding. The movement is nearly all in the admirably-modeled beard which sweeps his breast. The drapery is abundant and sweeping, and adds to the majesty of the figure. The first thought which naturally presents itself is, Who is the original of the "Wisdom"? At first sight "Moses" presents itself, but it is not the harsh, imperious lawgiver of the Jews as portrayed by Michelangelo. It is not "Minos," or "Lycurgus," or "Solon," but it partakes, perhaps, of something of all. It is, however, distinctively American in type. It is one of the most impressive statues which have been modeled in America, and perhaps the whole work may be summed up in the inscription, which says:

"Every Law not Based on Wisdom
is a Menace to the State."

THE "BREAKERS" AT NEWPORT.

The recent death of Cornelius Vanderbilt, Sr., makes the publication of a view of his palatial Newport residence, the "Breakers," most opportune. Our view is taken through the gate, giving a most picturesque view of the house. It is situated at Ochre Point, and was built to take the place of another superb villa which was destroyed by fire. The architect of the "Breakers" was the late Richard Morris Hunt. It is built in the Italian Renaissance style, and is one of the most sumptuous houses in America. It is three stories in height, and in the rear the main mass of the house is projected forward into two pavilions, connected by an open loggia. The porte-cochère in front is penetrated by three arches, and the entrance way leads into the main hall, which rises to the height of two stories, and is richly decorated. The main staircase is a most elaborate affair, and part way up it divides, leading off into two opposite directions. The dining-room is a stately apartment, and is exquisitely decorated with the finest marble and sculpture. The library, billiard-room, loggia, and in fact all of the rooms of the house, show the splendid taste with which Mr. Hunt was endowed. There is hardly a house in the country which can compare with the "Breakers" for magnificence.



THE "BREAKERS" AT NEWPORT.

GOLDEN GATE PARK, SAN FRANCISCO.

Golden Gate Park, San Francisco, is not only the pride of the municipality, which has expended over $2,000,000 in its creation and endowment in the last twenty-eight years, but of the whole State of California as well. It represents in miniature the floral and horticultural resources of a region which rightly regards itself as the most favored, in the exuberance of its soil and the variety of its productions, of all the States constituting the American Union. In the 1,040 acres of the superficial area of the park there may be found growing every flower, shrub, or tree that is indigenous to the State. The extent of this wonderful park entitles it to an honorable position among the great ones of the world, and its position, fronting directly upon the shores of the Pacific Ocean, is incomparably the finest of all the parks in existence. We give illustrations on pages 68 and 69.

The movement for the establishment of a park for San Francisco began in 1870. At that time the whole Western portion of the peninsula was a sandy unoccupied district. The project was ridiculed by some and regarded as impracticable by many more. But the project was finally approved, all opposition was silenced, and a tract four miles in length and one-half mile wide was secured for park purposes The tract was covered with scrub oak and a scant growth of manzanita. Billowy hills of sand marked the surface nearest the sea. Not a blade of grass or a single wild flower found sustenance on the entire expanse; there was nothing to suggest a great public playground but its magnificent situation and splendid scenic surroundings. The bleak sandy wastes are now covered with verdure and miniature forests, and by the art of the skillful landscape architect every natural feature of the park has been utilized so as to add beauty to its every section and impart delight to every sense. By infinite labor this surface has been transformed into a deep and fertile loam, so that now there is no plant of semi-tropical growth that cannot be made to flourish as in its own natural environment. The temperature of the locality rarely falls below 40° above zero. The damage from light frosts is small. Plants, ferns, and flowers that in temperate climates can only be grown under careful protection, here flourish out of doors as in their native clime.

The improvement of the park has been gradual, and at times hampered by insufficient appropriations. Twelve years ago the commissioners had to be content with an annual expenditure of $40,000, but popular demand has been effective in increasing the allowance for park purposes to $250,000. All the minor parks of the city are in the custody of the commissioners, and receive their stocks of plants from the conservatory of the Golden Gate Park.

The entire 1,040 acres of the park is now under cultivation. In 1897 no less than 700,000 trees and 350,000 plants were set out. The western half will, in time, be one great forest, and in a few generations the pines and redwoods will be approaching in size their ultimate gigantic stature.

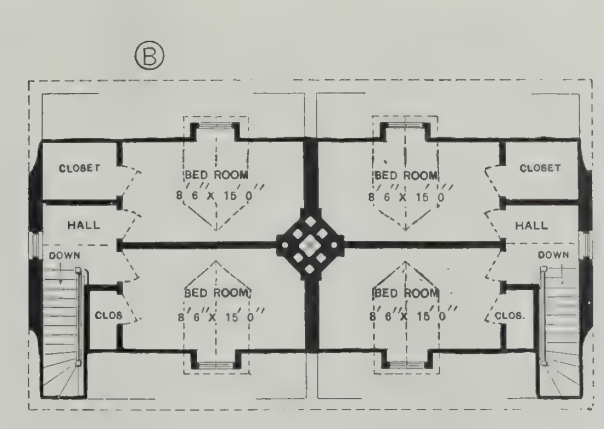
The eastern half of the park, being most accessible and sheltered from the ocean winds by intercepting elevations, has the monopoly of artificial adornment. Here are the wide lawns, the extensive conservatory, children's playgrounds, aviaries, music stands, deer parks, department of zoölogy, and other features of instruction or recreation. Scattered throughout the wide expanse and located in commanding positions are statues and fountains, some of them not altogether beyond criticism as works of art, but serving their part in the task of educating the public taste.

The great feature of Golden Gate Park, and one peculiar to itself, is Stow Lake, named after a park commissioner, who first suggested its creation and was the

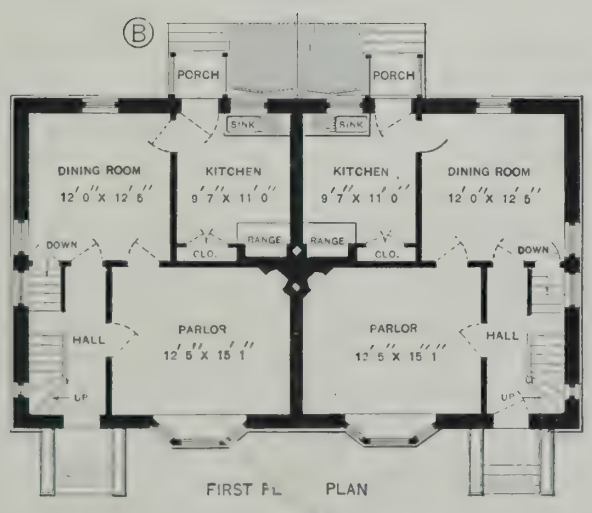
(Continued on page 75.)

AN ENGLISH COTTAGE AT LARCHMONT, N. Y.—See page 77.

MR. FRANK A. MOORE, ARCHITECT.



THIRD FLOOR PLAN



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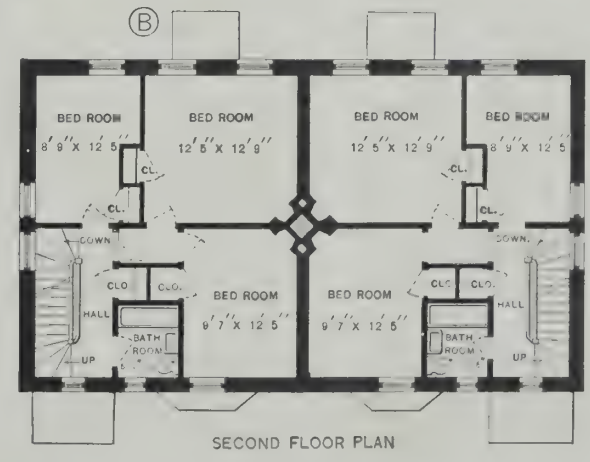
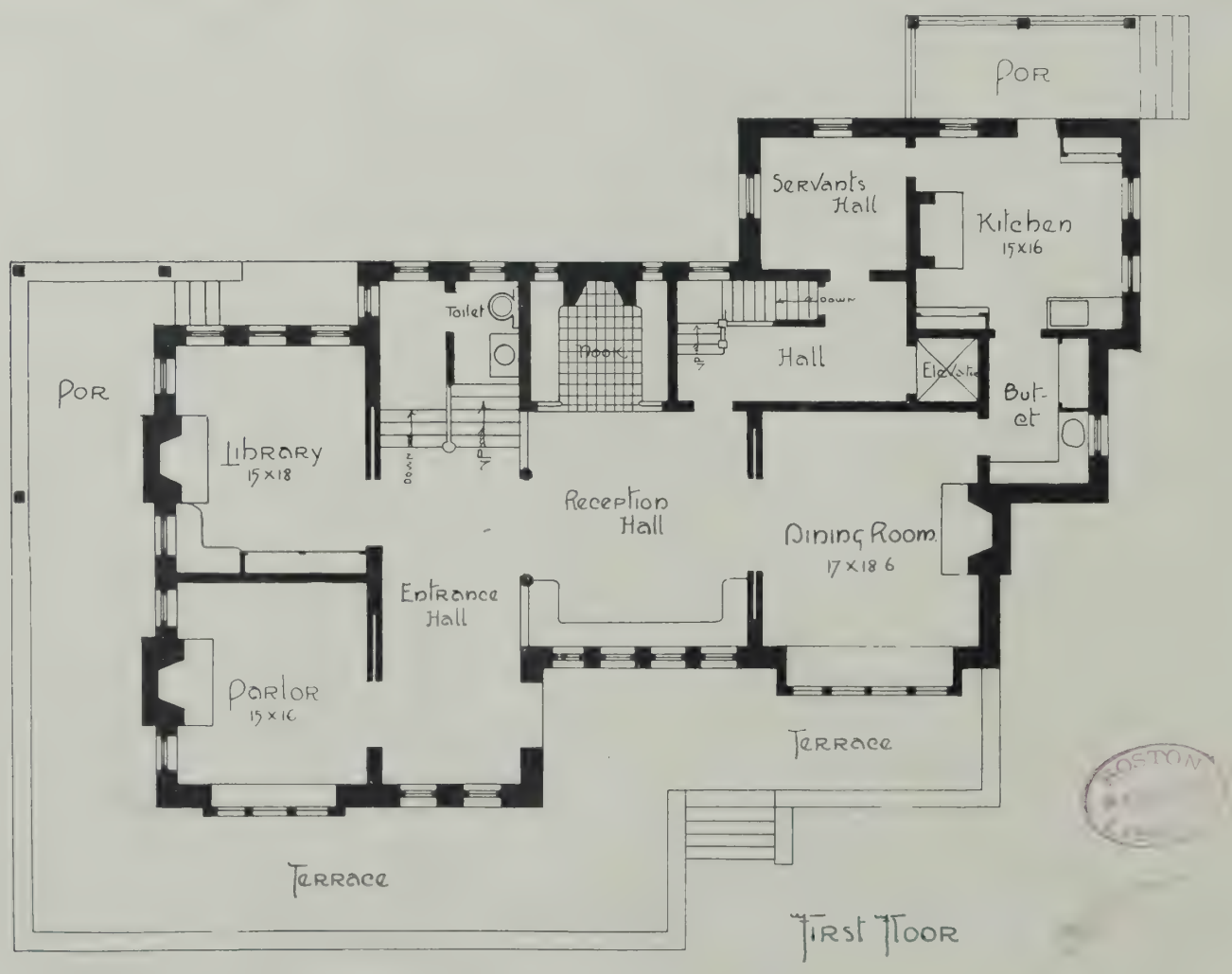


SECOND FLOOR PLAN

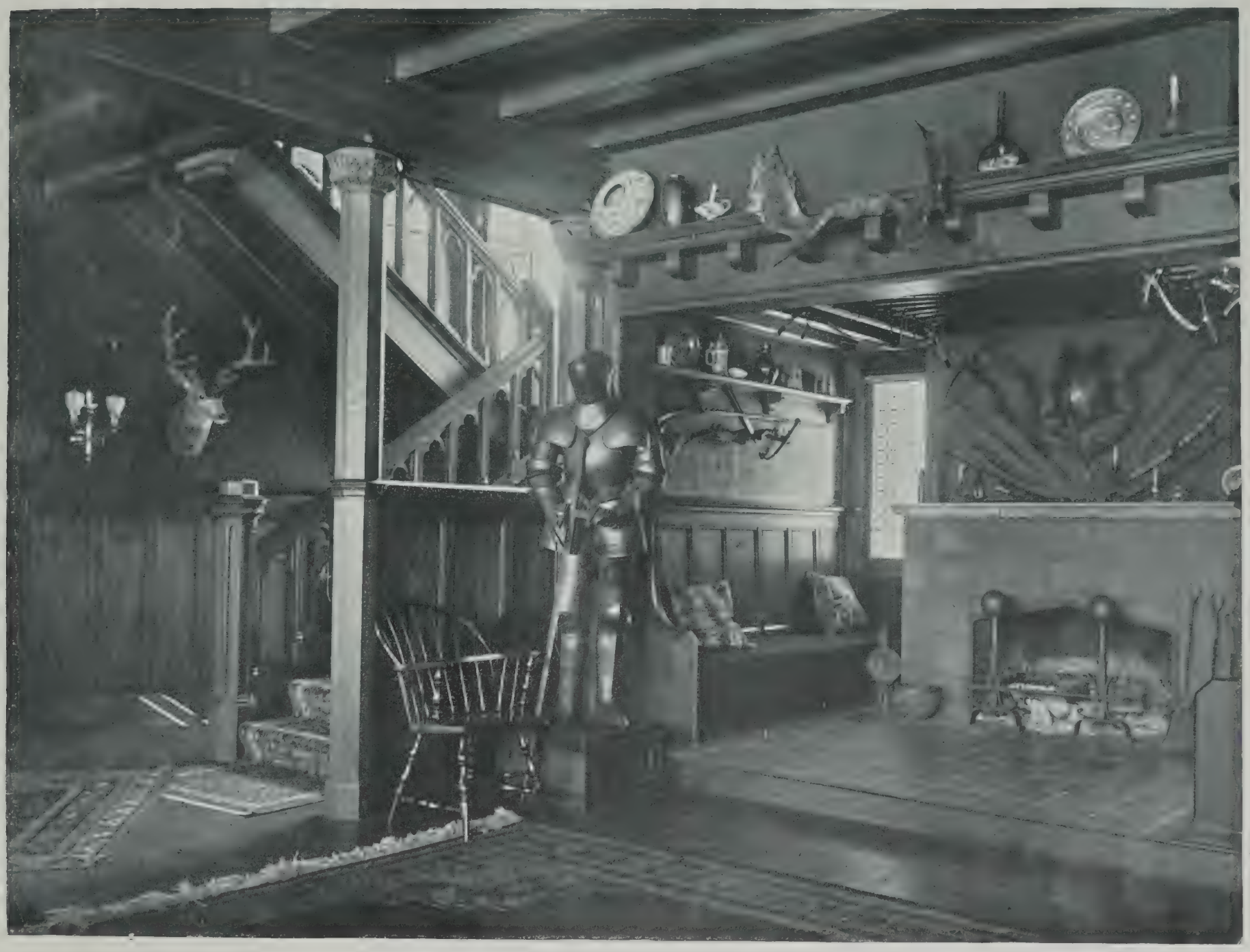
A DOUBLE DWELLING HOUSE AT HOMEWOOD, L. I.—See page 77.

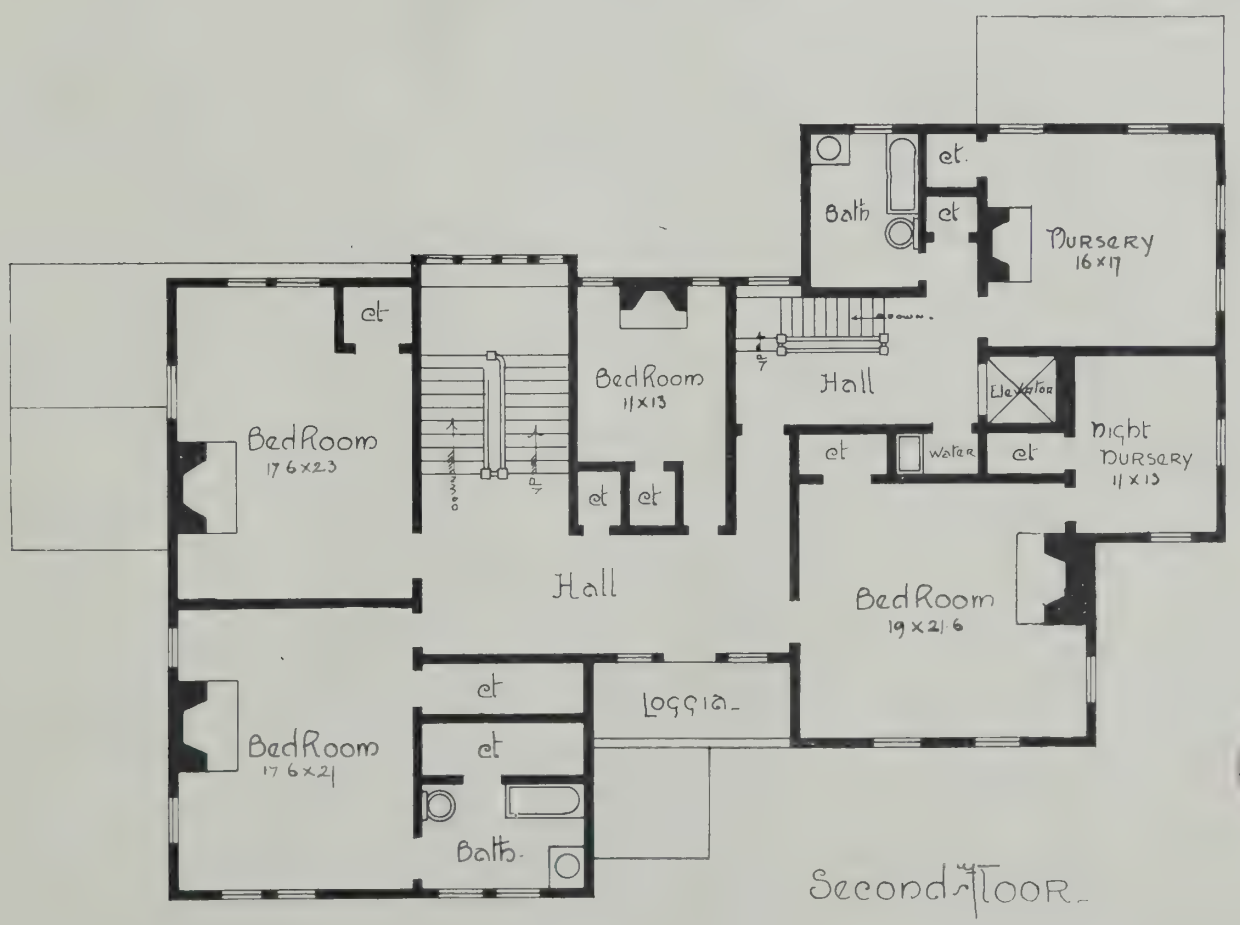
MR. PERCY GRIFFIN, ARCHITECT.



A RESIDENCE AT PITTSBURG, PA.—See page 76.

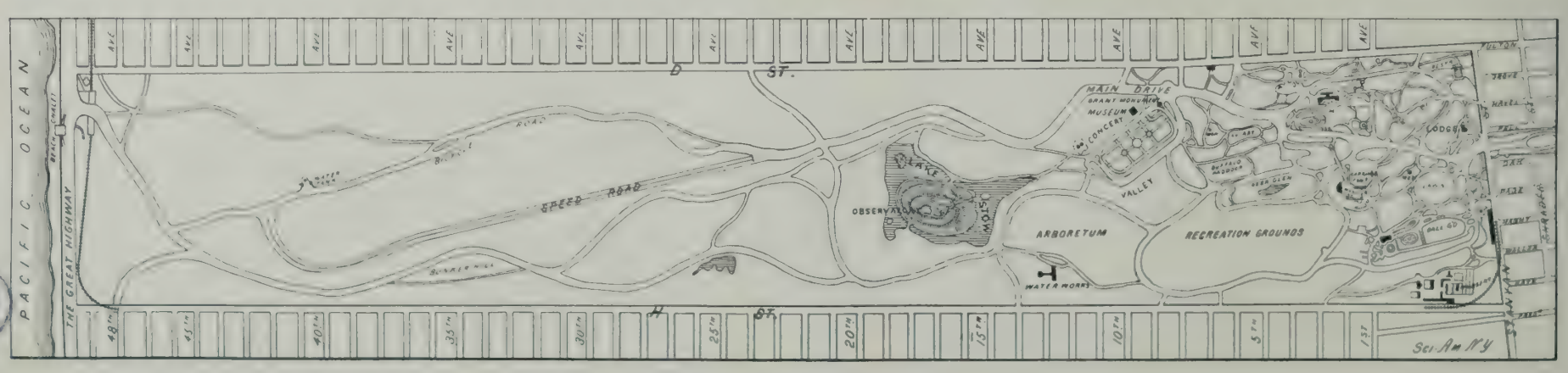
MESSRS. RUTAN & RUSSELL, ARCHITECTS.





A RESIDENCE AT PITTSBURG, PA.—See page 76.

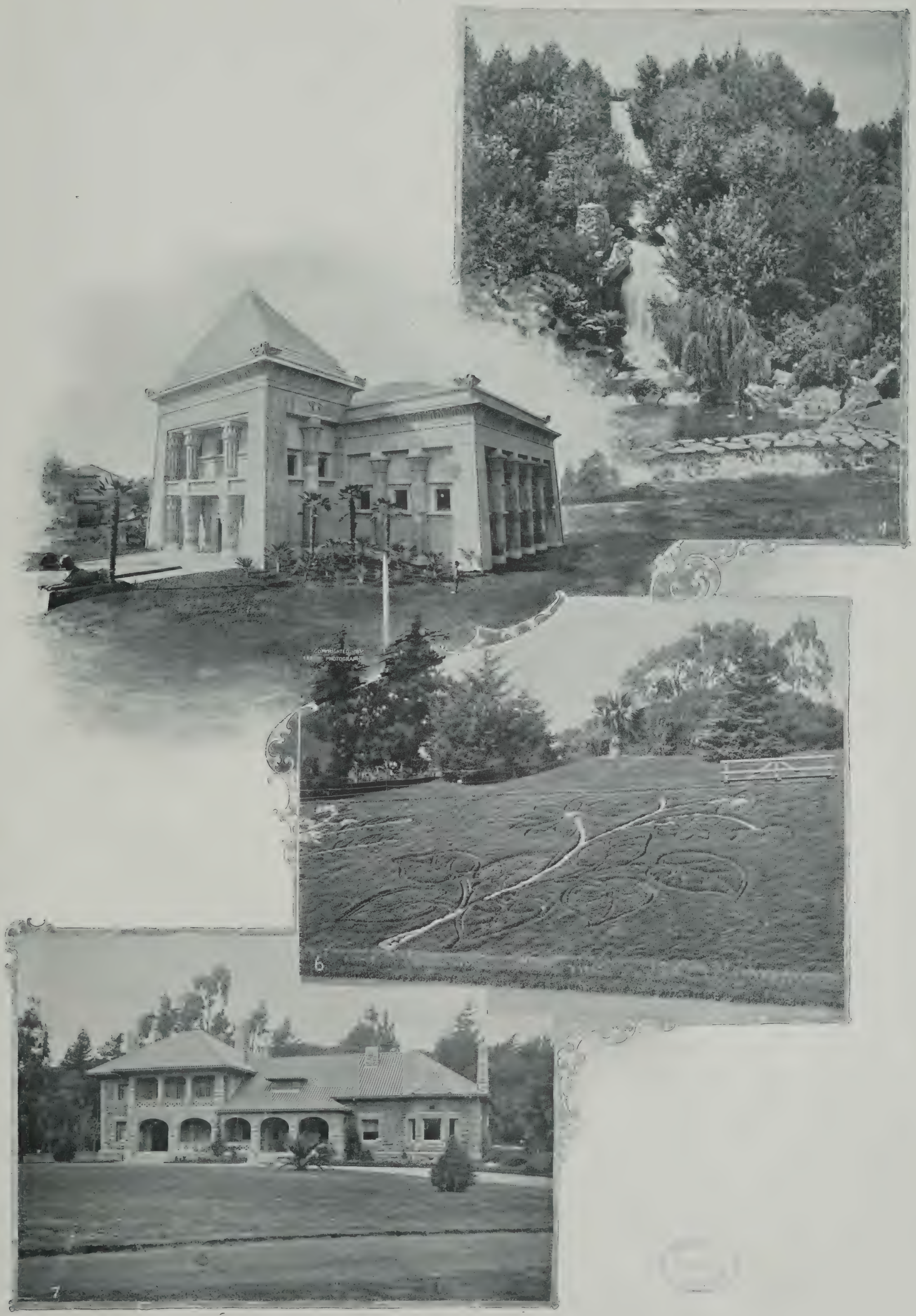
MESSRS. RUTAN & RUSSELL, ARCHITECTS.



MAP OF GOLDEN GATE PARK.

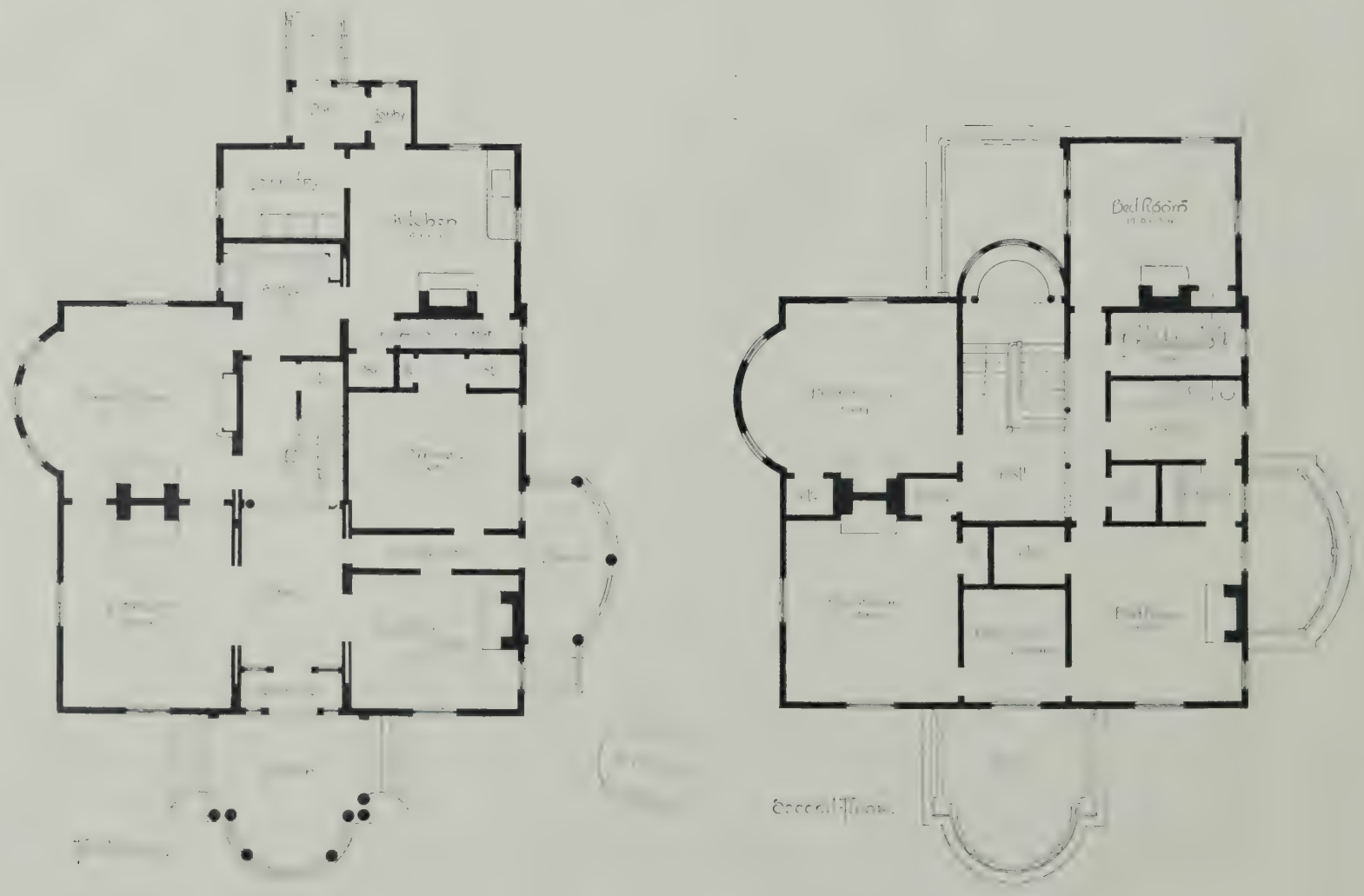
1. Tree Ferns. 2. Strawberry Hill Observatory. 3. Strawberry Hill and Stow Lake.

GOLDEN GATE PARK, SAN FRANCISCO, CAL.—See page 63.



4. Huntington Falls. 5. Fine Art Building. 6. Lawn Embroidery. 7. The Park Lodge.

GOLDEN GATE PARK, SAN FRANCISCO, CAL.—See page 63.



A PHYSICIAN'S RESIDENCE AND OFFICE AT CHURCH LANE, FLATBUSH, L. I.—See page 77.

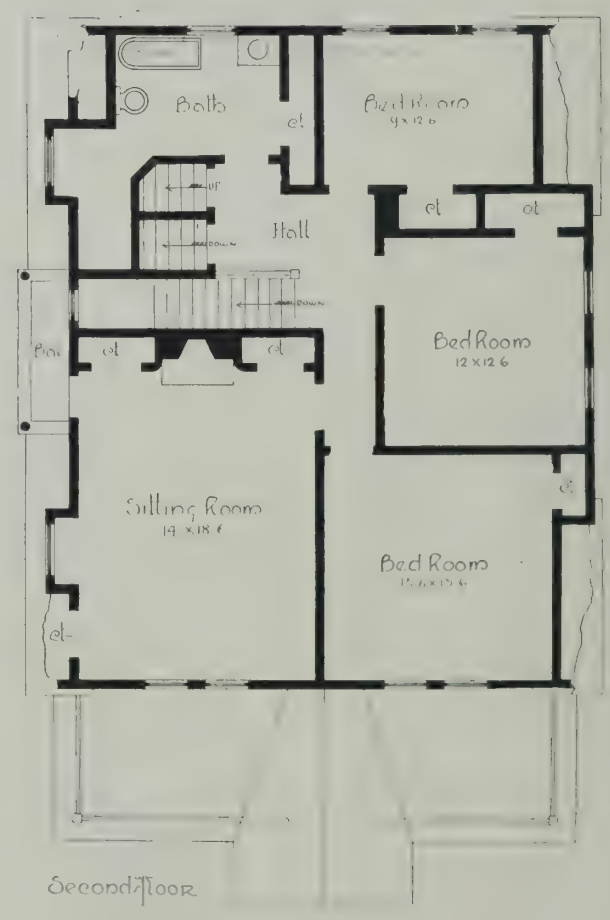
MR. J. J. PETIT, ARCHITECT.

First Floor Plan

Second Floor Plan.

A MODERN DWELLING AT NEWARK, N. J.—See page 76.

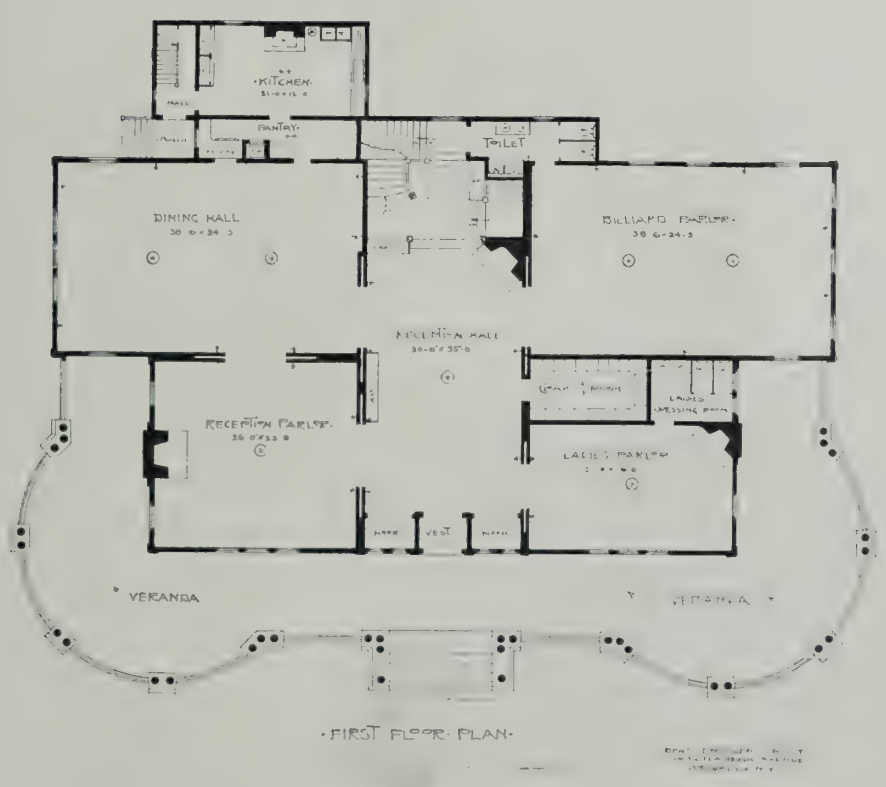
MESSRS JOHN H. AND WILSON C. ELY, ARCHITECTS.



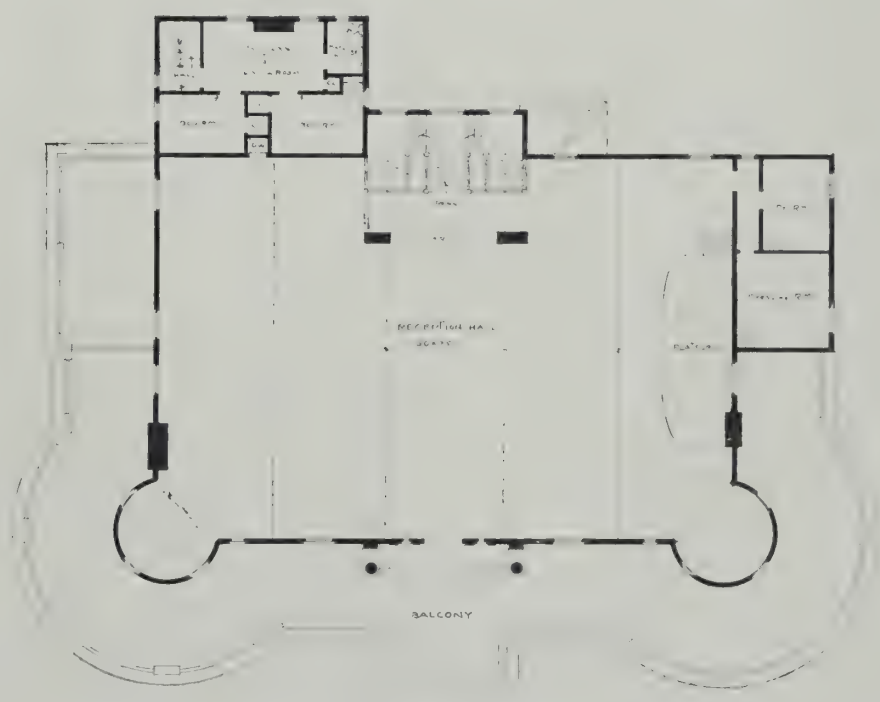
A MODERN DWELLING AT SPRINGFIELD, MASS.—See page 76.

MESSPS. GAGNIER & ANGERS, BUILDERS.

CELLAR PLAN.



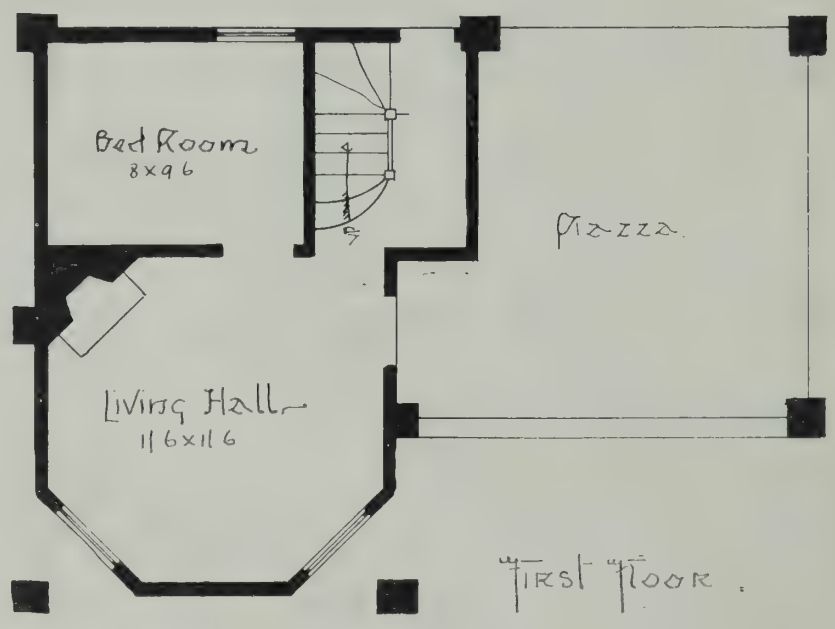
FIRST FLOOR PLAN.

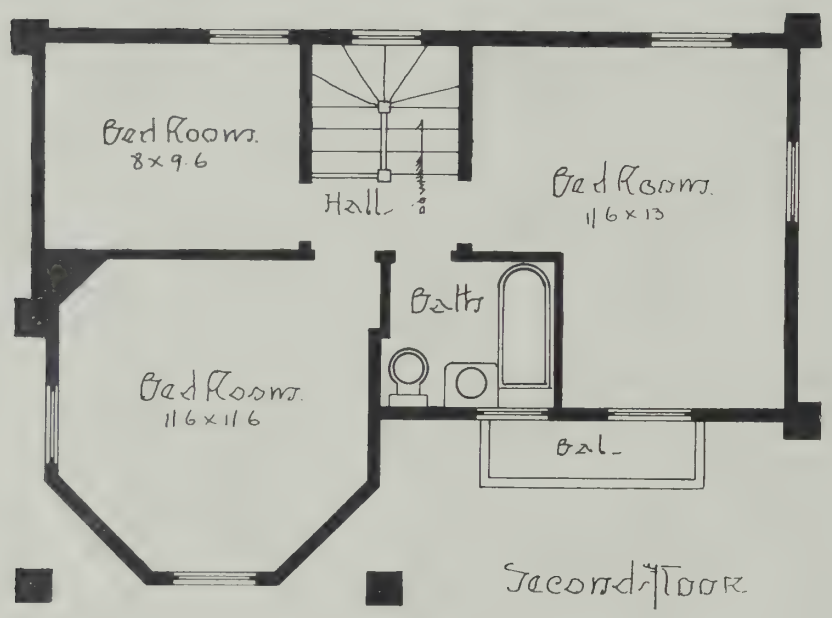


SECOND FLOOR PLAN.

BOROUGH PARK CLUB, AT BOROUGH PARK, BROOKLYN, N. Y.—See page 76.

MR. BENJAMIN DRIESLER, ARCHITECT.





A GROUP OF DEAL COUNTRY CLUB COTTAGES AT DEAL BEACH, N. J.—See page 75.

MR. WILLIAM GARDNER MASSARENE, ARCHITECT.

GOLDEN GATE PARK, SAN FRANCISCO.

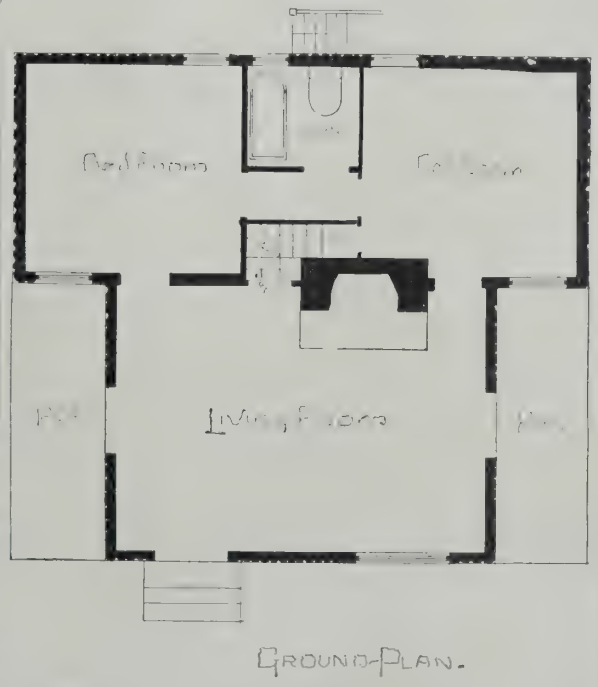
(*Continued from page 63.*)

principal factor in its ultimate accomplishment. Almost in the center of the park rises a bold elevation known as Strawberry Hill, with its summit rising 412 feet above the tide and embracing a view of the whole peninsula upon which San Francisco stands, and of all the country included within a radius of thirty miles. To the north, the whole course of the Golden Gate from bay to ocean is distinctly visible. Mount Tamalpais, which dominates the wide expanse, rises in splendid outline, dwarfing the numerous peaks of the coast range, which rise in irregular form north of the harbor entrance. The views of the Pacific from this point are superb, and the white surf of the beach can be discerned for miles in either direction. The whole circumference of Strawberry Hill, at a point 112 feet below the summit, has been cut down in order to form Stow Lake, the débris thus removed being thrown out so as to form its foundation and outward banks. The roadway thus created is one mile in length, and the lake formed is of sufficient extent to allow boat racing and other aquatic enjoyments. Of course, boats are provided in great numbers, and a handsome boathouse adorns the shore. A picturesque bridge spans the lake at one point, giving access to the island in the center. From the summit to the water is exactly 112 feet, and down this incline dashes an artificially constructed cascade, a strikingly beautiful feature and a source of rare enjoyment to all visitors. The lake, besides being visually delightful, serves as the storehouse for all the water used in irrigating the entire park. Waterworks supply 125,000 gallons hourly, and the lake, with its 25,000,000 gallons elevated 300 feet above tide, affords a splendid gravity system for all purposes.

The affection entertained by the people of San Francisco for their great park is demonstrated in many practical ways. James Lick was one of its early benefactors and gave the conservatory, which contains a magnificent collection of plants and flowers gathered from tropical countries and the isles of the Pacific. The orchid collection is a rare one, and embraces 8,000 varieties. The collection of ferns and lilies excites admiration, and if curiosity prompts an investigation as to the temperature and amid what floral surroundings our troops are fighting in Manila, a visit to the tropical section of the conservatory will give all the experience required. The late Senator Sharon left a large amount for the benefit of the children visiting the park, and the fine stone structure and the adjoining playgrounds for their exclusive use was the result. To M. H. DeYoung, of the San Francisco Chronicle, the park is indebted for the museum, with a picturesque building and a rapidly increasing collection of curios and paintings. To James Lick is also due the fine Story statue of the author of the "Star Spangled Banner," erected at a cost of $50,000, and to C. P. Huntington for a like amount, used in the construction of Huntington Falls, and the further adornment of Stow Lake. Numberless other gifts have been made to the park, all testifying to the supreme interest entertained for it by all classes and conditions.

The last conspicuous benefaction has just been announced, coming from Claus Spreckels, who has authorized the erection of a music stand in the valley at the foot of Strawberry Hill, without limit as to cost. A design has been accepted, consisting of a central temple, with pillared porticos extending to the right and left in classic style. The cost will exceed $75,000. Another benefactor contemplates the gift of a great triumphal arch over the eastern entrance. The æsthetic influence of this park upon San Francisco and its people has been unmistakably great. Not only the city, but the whole State has learned what this great object lesson of beauty is silently teaching. The crowd finds no place of equal entertainment anywhere, and one effect has been to almost abolish the Sunday picnic. Rarely a Sunday passes in which 50,000 people are not to be seen here, well-appearing and behaved. The vast benefit of the park to a great city is seen also in the improved appearance of private grounds throughout, and the added beauty thus afforded. In fact, San Francisco never realized how capable of adornment the sandy peninsula, upon which the city is built, was until Golden Gate Park became an actual reality.

A BUNGALOW AT DEAL BEACH, N. J.



A GROUP OF DEAL COUNTRY CLUB COTTAGES AND A BUNGALOW, AT DEAL BEACH, N. J.

WE present on page 74, in this issue, a group of cottages, and also, on this page, a bungalow, erected recently for the Deal Country Club, at Deal Beach, N. J., and by the Atlantic Coast Land Company. These unique cottages, illustrated herewith, together with sixteen cottages, inclusive, were designed and erected under the personal direction of Mr. William Gardner Massarene, an architect, who has the happy faculty of creating and producing the most novel, unique, and attractive bits of architecture in a very short space of time. Mr. Massarene was engaged to do the work in February, and submitted six different

sketches. The company subsequently decided to use the type cottage in the Moorish treatment, which we show on page 74. In order to facilitate the work, two plans only were adopted, and the elevations were changed in each, so that all of the cottages, while of the same plan, are unlike in their appearance, and are treated in the Queen Anne, Moorish, Spanish, and Colonial style of architecture, with Indian or Hindoo mixed in for contrast. On April 20, orders were placed with two mills for enough lumber to construct the houses, and in order to still further the work three sizes were used to avoid confusion, viz., sills, corner posts, heavy plates, etc., 4 x 6 inches; beams, 2 x 8 inches; studs, rafters, braces, ceiling beams, etc., 2 x 4 inches, all of hemlock. When in changing designs it was necessary to get extra spans requiring stronger timber, they were either doubled up or simple trusses built out of beams and 2 x 4 inch. The buildings were braced well and sheathing was omitted. The doors and windows were ordered in the same size for all the houses, and where a short door was required for a cupboard, a full-sized door would be cut in two, using the top half where desired. The work was started on May 2, and twelve cottages were completed on July 1, and the remaining four on July 10. One coat of plaster (King's Windsor scratch coat) was used on walls and ceilings, which were afterwards tinted with King's cold water paint for finish. The trim throughout was simply mitered whitewood, usually painted white. The doors and jambs are of cypress, filled and varnished natural. Each house contains a living-room, with three, four, or five bedrooms and bath complete, as the case may be. The living-rooms have open fireplaces built of brick, with hearth and facings of same, and neat mantels. The bathrooms are wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The color treatment outside is varied according to the number of stock shingle stains on hand, contrasts of dark brown, green, gray, and red against white paint being used principally. All detail effect for the interior, including mantels, stone ornaments, paper, draperies, furniture, etc., were ordered a long time in advance of the time in which the buildings were started.

The bungalow, of which we present an illustration on page 75, imitating the Mexican hut, is most unique in every particular, owing to the fact that it was constructed of the refuse left from the erection of the sixteen cottages. This fact is of peculiar interest in showing what can be done with odd bits of materials. The exterior is covered with logs, placed in position and left with the bark on same. The building is sheathed and then covered with two thicknesses of building paper and painted before the logs are placed in position. The gables are plastered, and are stuccoed with brick. The entrance is through a Dutch door into a living-room, which also has French windows opening out upon the porches, which are placed on either side of room. The ceiling of this room takes in the full height of building. The walls, to the height of seven feet, are wainscoted with matched boards stained a dark brown color, soft in tone, while the trimmings are painted a soft cream color. The whole is finished with a moulded shelf cap. Above this cap the rafters are exposed to view, and are stained a dull greenish color, which gives a sky effect at night when the lower part is lighted up. The fireplace runs right up through the room, and is built of brick, with hearth of same. There are also on this floor two bedrooms and bathroom, the latter having porcelain fixtures and exposed nickelplated plumbing. The second story is reached from living-room and from outside. It contains the man's quarters and kitchen and its various apartments complete. Mr. William G. Massarene, architect, Deal Beach, N. J.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

(To be continued.)

BOROUGH PARK CLUB, BOROUGH PARK, BROOKLYN, N. Y.

The engravings on page 73 illustrate an ideal suburban clubhouse, "The Borough Park Club," at Borough Park, Brooklyn, N. Y. As the subject is not entirely a new one, the object in presenting this clubhouse is not only to show an ideal clubhouse building, but to present a suburban club combining all the facilities for both indoor and outdoor amusements, with an object of creating a local interest in social and moral influence among the members who are necessarily residents of the "Park." The building is situated forty feet from Thirteenth Avenue, and in the center, between Fiftieth and Fifty-first streets, the ground rising to the front and sides. In the rear of the building the ground is devoted to baseball, football, cricket, and lawn tennis fields, beyond which is a quarter of a mile driving track. There is also a large stable and livery accommodation in connection with the club for the benefit of its members. The building is approached by way of a semicircular concrete drive and walks, leading to stone steps of veranda, flanked on either side by massive stone butment piers. The perspective presents a finely proportioned structure, of substantial and economical construction, treated in Colonial style of architecture. The underpinning is built of selected field stone, laid in regular courses. The superstructure, of wood, is sheathed diagonally, then covered with paper. The first story is covered with clapboards painted a medium drab, while the second story and gables are shingled and stained a butternut brown. The roofs are shingled and stained a warm olive green. The trimmings are painted a pure ivory white. The building is 100 feet long and 50 feet deep, exclusive of extensions in rear and piazza. The cellar is 12 feet high, and the first story 15 feet, and second floor 10 feet. The main entrance is directly opposite to approach of veranda, through spacious double doors and vestibule, leading to a center hall, 20 feet wide and 56 feet deep, inclusive of staircase in the rear. This staircase is a double flight one, right and left, starting from a raised platform, flanked to the right by a large brick fireplace, and spanned over principal approach with a Moorish grille supported on pilasters and columns. The first landing contains a cluster of finely colored art glass windows, distributing their effective rays throughout the hall. The central main staircase platform is open underneath passage way, leading on the left to stairway to basement, and on the right to toilet room. This hall is trimmed with oak, and it has a paneled wainscoting 6 feet in height, a paneled beamed ceiling and massive carved hall seats. There are also nooks at either side of vestibule with stained glass windows. Above the wainscoting the walls are decorated in deep red. The ladies' parlor, at right of entrance, is treated in white enamel and gold, and it contains an open fireplace with tiled facings and hearth and mantel and a large cabinet mirror. The dressing room is finished in white, and has tiled floor and wainscotings, bevel plate mirrors, Italian marble and porcelain fixtures, with nickelplated trimmings. The cloakroom is located conveniently, and is arranged for quick service. The reception parlor, used also as a gentlemen's smoking room, is trimmed with cherry, with wall decorations of gold on pale blue ground. It has a deep fireplace, with tiled facings and hearth and a carved mantel. The billiard room is trimmed with quartered oak, and it has a paneled wainscoting all finished antique, flooring of parquetry, a door opening into toilet, which is fitted up with tile floor and wainscoting, porcelain fixtures, and nickelplated plumbing The dining hall is trimmed with quartered oak, and has a parquet flooring, high paneled wainscoting, and a buffet built in. The kitchen and pantries are trimmed and wainscoted, and are fitted up with all the best modern improvements. The separate entrance and rear hall, with stairway, lead up to apartments, above kitchen, sufficiently large enough to accommodate two or three persons who may be caretakers about the building. The second floor is devoted to an assembly hall, 50 feet by 75 feet, flanked on each front corner by circular bays. A stage at one end, with the usual dressing-rooms for use at entertainments. The apex of ceiling is dome shaped, and 27 feet from floor, transfixed by symmetric trusses, adding to rather than detracting from the loftiness and spacious effect. The ceiling is ceiled up with Georgia pine, and the walls are wainscoted up to a height of 5 feet. The floor is of maple. The basement contains a café, cemented cellar for heating apparatus, three bowling alleys, and toilet room. The café has fine old-fashioned brick fireplace and hearth, and the walls and ceiling are of Georgia pine. The building is wired for incandescent electric lighting, bell system, and gas lighting. Combination light fixtures are of elegant design, in various metals, suitable to match decorations. Mr. Benjamin Driesler, architect, 1432 Flatbush Avenue, Brooklyn, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT NEWARK, N. J.

The engravings shown on page 71, in this issue, illustrate a modern dwelling which has been erected for Col. William S. Righter, at Mt. Prospect Avenue, Newark, N. J. The design is treated in a very attractive style, and it combines a happy treatment of field-stone and shingle work. The underpinning, part of first story, and all stonework where shown around piazza are constructed of local rock-faced stone, laid up at random. The remainder of the first story is of wood, with the exterior covered with sheathing, paper, and clapboards, and then painted light olive green. The second story and gables are covered with shingles and stained a moss green. The roof is also shingled and stained a dull green. Dimensions: Front, 31 ft. 6 in; side, 44 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. 6 in. The hall is trimmed with oak. It has massive ceiling beams, a paneled staircase, with newel posts and balusters. The newels are handsomely carved. The den is really part of the reception hall, and is separated only by a beamed arch. The den contains a large open fireplace, built of field stone, with facings of same, and a cobblestone hearth. The mantel shelf is of oak, supported upon massive carved brackets, above which there is a paneled over-mantel rising to ceiling. The parlor is separated from the hall by an archway provided with columns, fluted and fitted with Corinthian capitals. This parlor is treated with white and gold, and it contains an open fireplace, furnished with cream white enamel tile and a mantel with carvings and mirror. The dining-room is trimmed with cherry, and it has a bay window thrown out at side, a conservatory at rear nicely fitted up, and an open fireplace trimmed with tiled facings and hearth, and mantel with Corinthian columns rising to ceiling. The kitchen and pantries are trimmed and wainscoted with yellow pine, and are fitted up complete with all the best modern fixtures. The second floor is trimmed with pine and painted white. It contains an open hall, four bedrooms and bathroom, the latter being painted white and furnished with porcelain fixtures and exposed plumbing, all nickelplated. There are three rooms and ample storage on third floor. A cemented cellar contains furnace, laundry, and other necessary apartments. Messrs. John H. and Wilson C. Ely, architects, 756 Broad Street, Newark, N. J.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A RESIDENCE AT PITTSBURG, PA.

We present, on pages 66 and 67 in this issue, a residence which has been erected for Louis G. Clarke, President of the Pittsburg Motor Vehicle Company, at Pittsburg, Pa. The engravings show a most attractive design, treated in the English half-timbered style of architecture. The main architectural features are the gables, chimneys, porches, the terrace surrounding the main part of house, and the cluster of leaded glass windows. One of the most attractive features of the property is the stone wall fence in front, which is constructed of huge rock-faced boulders laid up at random. The stone arched gateway is a unique feature. The terrace, surrounding the building and first story, is built of Beaver Valley sandstone. The second story and gables are beamed in the Elizabethan style, and stuccoed with Portland cement. The beams are painted a dark bottle green. The roof is covered with shingles and stained a dark dull green color. Dimensions: Front, 78 ft.; side, 54 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The interior arrangement is most excellent. The main hall and staircase and reception hall are treated in the Gothic style, and are trimmed with chestnut, stained a dark rich old oak. The staircase is a very handsome one, with Gothic balustrade, and newel posts with carved caps. The nook is treated in a unique manner, with an open fireplace with facings and hearth laid with square tile. The nook has a floor laid with similar tile, and seats running along each side. The ceilings and walls of both apartments have paneled wainscotings and ceiling beams. The parlor is treated in the old Dutch style and is trimmed with sycamore. It contains an open fireplace, with tiled facings and hearth, and mantel. The library is treated in the Gothic style, and is trimmed with sycamore, which is finished in a deep rich color. It has a bookcase, paneled wainscoting, and seat, and fireplace built in, the latter having tiled hearth and facings and mantel. The dining-room is trimmed and treated in a similar manner, and it contains a beamed ceiling, paneled wainscoting and seat, and an open fireplace, furnished with a tiled hearth and facings, and a hardwood mantel. The rear hall, servants' hall, kitchen and its apartments, are trimmed with North Carolina pine, and are fitted up in a complete manner with all the best modern improvements. An excellent feature of this floor is the elevator lift, which runs from laundry in cellar to third floor. The second and third floors are trimmed with North Carolina pine. The second floor contains an open hall, four bedrooms, day and night nurseries, nine closets, and two bathrooms, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two large servant bedrooms, servants' bathroom, trunk-room, sewing-room, and playroom, the latter being 25 x 27 feet. The house is lighted by electricity and gas, and is furnished with electric burglar alarms. A cemented cellar contains laundry, two drying-rooms, boiler-room, and other necessary rooms. In the rear of the house there is a small carriage house for automobiles, bicycles, etc. Messrs. Rutan & Russell, architects, Tradesman's Building, Pittsburg, Pa.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT SPRINGFIELD, MASS.

The engravings shown on page 72, in this issue, illustrate a modern dwelling which has been recently completed for Messrs. Gagnier & Angers, at Springfield, Mass. The design presented has a striking appearance and many excellent features, including a gambrel roof, bay windows, and a well-shaded piazza. The underpinning is constructed of brick laid up in red mortar. The superstructure is of wood. The first story is clapboarded on the exterior and painted a light pea green, with cream white trimmings. The second and third stories are covered with shingles and stained a moss green with mottled effect. The roof is covered with

shingles and stained in harmony with the body color. Dimensions: Front, 31 ft.; side, 39 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The interior arrangement is most excellently arranged. The large reception hall is a feature of this house. It contains a nook with paneled seats, a lobby with coat closet and an entrance to parlor, and an ornamental staircase winding around fireplace, with a bay window thrown out at side and provided with seat. The fireplace is built of brick, with facings and hearth of pressed brick, and is provided with a handsome oak mantel. The trim of hall is also of oak. The parlor is trimmed with pine and treated in old ivory white. The dining-room is trimmed with butternut, finished in its natural state. The kitchen, etc., are trimmed with whitewood, treated natural. These apartments are furnished with the best modern conveniences complete. The second floor is treated in tints of colors in a delicate manner, and it contains a large sitting-room, three bedrooms, and bathroom. The latter is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage space. A cemented cellar contains furnace, laundry, and other necessary rooms. Cost, $4,500 complete. The house was designed and built by Messrs. Gagnier & Angers, builders, of Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

AN ENGLISH COTTAGE AT LARCHMONT, N. Y.

The engravings on page 64 illustrate a cottage of English treatment, which has been erected for L. S. Knerak, Esq., at Larchmont, N. Y. The illustrations show an excellent example for a suburban villa, with artistic exterior elevations combined with an excellently arranged plan. The underpinning is constructed of local granite with rock faces. The exterior framework above is covered with sheathing, paper, and cedar shingles left to weather finish, while its trimmings are painted bottle green and the sash white. The gables are coated with plaster of a grayish white color. The roof is shingled and finished natural. Dimensions: Front, 37 ft. 8 in.; side, 31 ft. 2 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The interior is trimmed with white pine, and the hall and all the principal rooms are treated in china white. The hall contains an ornamental staircase, with mahogany steps and rail, and white enameled posts and balusters, and a paneled seat. This hall is separated from parlor by an archway formed from a base, from which rise ornamental columns to ceiling, presenting an arcaded effect. The parlor and dining-room each have open fireplaces, furnished with tiled hearths and facings, and mantels of handsome design. The latter has also a bay window thrown out, with buffet built in, with a stained glass window over same, glazed with delicately tinted glass, which sheds a pleasant light over this apartment. The library contains a box seat in bay window, and an open fireplace built of Roman brick, with facings and hearth of same, and mantel of wood. The kitchen and its apartments are trimmed with North Carolina pine and furnished complete with the best modern conveniences. The second floor contains four bedrooms, six large closets, dressing-room, and bathroom. The bathroom is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains an open hall and four bedrooms. A cemented cellar contains laundry, furnace, and wine room. Cost, $5,000, including furnace and everything complete. Mr. Frank A. Moore, architect, 123 East Twenty-third Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A PHYSICIAN'S RESIDENCE AND OFFICE AT CHURCH LANE, FLATBUSH, L. I.

We present herewith, on page 70 in this issue, a physician's residence and office, which has been recently completed for Dr. Zabriskies, at Church Lane, Flatbush, L. I. The building is treated in the Colonial style with excellent detail, and the whole combination of good elevations and well arranged plans is most complete. The underpinning is built of rock-faced bluestone. The superstructure is covered with sheathing and clapboards and then painted white, with similar trimmings. The blinds are painted bottle green. The roof is covered with shingles and stained a moss green, with mottled effect. Dimensions: Front, 45 ft.; side, 46 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The main hall, entered through a vestibule with tiled floor and paneled walls, is trimmed with quartered oak. It is furnished with a handsomely paneled wainscoting and ceiling beams. It also contains an ornamental staircase turned out of oak, with spindle balusters and rail. This rail sweeps down, forming a cap for a cluster of spindle balusters as newel. This staircase hall is separated by an archway, supported upon columns rising to ceiling and finished with Ionic capitals. To the right of entrance is the physician's reception-room and office, with private hall and porch. These apartments are conveniently arranged, and are trimmed with cypress, treated in an artistic manner. The reception-room contains an ornamental fireplace, trimmed with tiled facings, and hearth and mantel. The parlor is treated with white enamel, and it contains an open fireplace trimmed with tiled facings, and hearth and mantel of Colonial style, made from special design. The dining-room is trimmed with mahogany, and it contains an open fireplace, with tiled trimmings, and mantel of excellent design, and a buffet built in, which is handsomely carved and furnished with cabinets, with beaded glass doors, etc. The archways between parlor and dining-room are pleasing features. The butler's pantry is trimmed with cypress, and is fitted up with the usual fixtures, including the drawers, cupboards, dressers, etc. The kitchen, laundry, and lobby are trimmed with similar wood, and are furnished with the best modern fixtures. The second floor is trimmed with cypress, and it contains a large open hall, four bedrooms, large closets, dressing-room, and bathroom, the latter wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains billiard-room, two bedrooms, and ample storage. A cemented cellar contains hot-air furnace and other necessary apartments. The cost is $8,000, including furnace, grading, and everything complete ready for occupancy. Mr. J. J. Petit, architect, 186 Remsen Street, Brooklyn, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A DOUBLE DWELLING HOUSE AT HOMEWOOD, L. I.

The engravings presented on page 65, in this issue, illustrate a modern double dwelling house at Homewood, L. I., erected for the City and Suburban Homes Company. The design is a combination of the Dutch and English styles. The building is constructed of Klinker brick, while the underpinning and trimmings are built of red brick. The porches have gable ends, beamed and plastered. The woodwork is stained a burned umber. The blinds are painted bottle green. The roof is covered with slate. Dimensions: Front, including bath-houses, 50 ft.; side, 27 ft., not including porch. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 7 ft. 6 in. The interior of each house is finished off alike, so a description of one will suffice. The plan is arranged in a most excellent manner, and is finished off complete. It is trimmed with cypress finished natural, and the floors are laid with matched Georgia pine. The hall contains an ornamental staircase turned out of cypress, with newel posts, rail, and balusters. The parlor has an open fireplace built of brick, with facings and hearth of same, and a wood mantel of neat design. The dining-room and kitchen are conveniently arranged, and the latter is fitted up with fireplace for range, sink and large closet. The second floor contains three bedrooms, four closets, and bathroom; the latter is wainscoted and fitted up with porcelain-lined bath-tub, closet, and lavatory. The third floor contains two bedrooms, with closets. A cemented cellar contains furnace, laundry, and other necessary apartments. Mr. Percy Griffin, architect, 48 Exchange Place, New York City, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

Josephine's Malmaison Restored.

The historic Château of Malmaison, famous for its intimate connection with Napoleon and the Empress Josephine, is, it is announced, about to be presented to the French Government. That the gift will be received with gratitude, the London Standard can hardly doubt, "since it recalls a period when French 'glory' was at its height; and we may hope that it will be guarded and cherished with more care than has been bestowed by the Third Republic upon the Palace of Versailles, which, despite its splendid memories of Louis Quatorze, is being allowed to fall into decay."

"France ought, indeed," says the writer of this article, "to be greatly obliged to M. Osiris, the simple particulier, who is the intending donor. When he bought Malmaison, two years ago, it was a ruin. The fine staircase was falling to pieces, there were gaping holes in the floors, it was dangerous to walk about the rooms lest the visitor's footfalls should bring down the ceilings upon his head. The beautiful Empire furniture had all vanished, and the greater part of the park had been cut up and sold in small lots. With the aid of taste and money, re-enforced by an enthusiastic admiration for the wonderful man who has been the object of so many idolatries, the Château has been restored from attic to cellar exactly as it was in the days of Napoleon and Josephine. The work is now approaching completion, and when it is finished M. Osiris will hand the place over to the State, on the sole condition that a museum of souvenirs of the Consulate and the Empire shall be brought together under its roof in time for the Universal Exposition of 1900.

"This, indeed, will not be the first time that Malmaison has been a Napoleonic museum. During the Paris Exhibition of 1867, when it was still full of relics of the Conqueror and his ill-regulated Creole wife—among them Josephine's harp, Napoleon's deathbed, the terrestrial globe from which the luckless little King of Rome learned geography—it was visited by hundreds of thousands of people. There has been so active a revival of interest in Napoleon during the last few years, that a restored Malmaison, full of reminiscences of what it was a century ago, is pretty certain to be one of the prime attractions of the exhibition year. Although the house is associated so closely at once with the happiest and wrechedest days of Napoleon's life, it was always the peculiar domain of Josephine. It was bought by her with almost the earliest savings of the First Consul, and there she established a kind of Trianon, in emulation of the more artificial pleasaunce created by Marie Antoinette at Versailles.

"The six or seven thousand pounds which she originally gave for the property was a very insignificant fraction of what it cost from first to last, for Lenoir remodeled it during the Consulate in a very costly fashion, and Josephine was continually adding to the amenities of her park by fresh purchases of land. In the height of her prosperity and happiness the Empress was, in all matters touching the adornment of her house, as of her person, a female counterpart of Carlyle's 'very expensive Herr.' The entrance hall and dining-room of Malmaison were lined with white marble; the roof of the library was supported upon solid mahogany pillars; the chimney-pieces were of porcelain; her bathroom and bed-chamber, with its golden toilet service presented by the city of Paris, have become legendary. Following the fashion of the time, she kept a menagerie in the park, which was watered by a stream brought at heavy cost from a distance. The house was full of fine pictures, and much of Canova's work lined the beautiful gallery.

"We can hardly doubt that the days which Napoleon, as First Consul, spent at Malmaison were far happier than those which followed his assumption of the crown. There he could be as free and easy as he chose, could spend pleasant, informal evenings with music, reading aloud, and simple charades; he could even keep the bank at vingt-et-un, and laugh when his innocent cheating was discovered. All that was necessarily altered when he became Emperor; the dignity of a brand new Court could not be sacrificed in that way. After the divorce, Josephine would not allow the rooms the Emperor had occupied at Malmaison to be touched. The book he had been reading lay open on his desk; his clothes remained scattered about his bedroom. To the last he constantly visited her; but they never met again after Napoleon's exile to Elba. She died comparatively suddenly at Malmaison within a week or two of his departure. That the grim Conqueror kept a tender spot in his heart for Malmaison is certain. Thither he went, after Waterloo, when he saw his career closing in gloom and failure, and from its door he started, in less heroic guise than he had left Fontainebleau little more than a year before, upon the road which led to the Bellerophon and lasting exile."

Asphalt as a Municipal Improver.

The press of September announced a meeting of the National Road Parliament, at Omaha, on October 8, in the grounds of Trans-Mississippi Exposition. From this meeting there should arise a movement of gigantic proportions, and full of promise for the good of the United States at large.

To one who has spent the last thirty years in a series of movings from one to another of the large cities north of the Ohio River and east of the Mississippi River, who has lived in seven of them for periods ranging from one to eight years, and who has visited nearly all of them at frequent intervals, there is given a basis for comparisons which is interesting historically and instructive as indicating the probable line of development.

A stay in Chicago, which began in the spring of 1866, was suddenly and unexpectedly terminated on October 9, 1871, by the great fire—a residence which was never renewed, though the city continued to be a sort of second home for many years. During the five years of actual residence the population increased and the city enlarged its boundaries, but there were no external signs of improvement. Pine boards formed the almost universal sidewalk, and for pavements (where there were any) pine blocks laid on rough boards were made to serve. It was at this time that the grade of the city was raised twelve feet, and, except for a few main streets, the footways were on trestles, which were interrupted at every intersection with a flight of stairs on each side of the roadway. This, it can be seen, did not add to the beauty of the city, and the awkwardness was increased by the heterogeneous character of the buildings, which were of all materials, but mostly of wood, and of no style of architecture; quite a moiety were several feet below the level of the street.

Lincoln Park had but just begun, and for half a mile north of what is now the entrance it was an abandoned waste—a favorite hunting-ground for boys and men who were satisfied to shoot sand-pipers. The Calumet marshes, too, which are now the site of Pullman and South Chicago, were the haunts of many sorts of game, even including deer, at least as late as 1875. In very truth,

there was excuse for the prophecy, seriously made, of a Bostonian who shared in the hegira on the day of the fire, to the effect that "in twenty years Chicago would be a wilderness, and the wolves would be howling through what had once been her streets."

Cleveland was the next stopping-place, and here the conditions were somewhat better, for the place was older; but even in that city, which was able to boast of its old families, there was no pavement worthy of the name in 1872, nor was there for many years after.

Pittsburg, Buffalo, Detroit, Rochester, and Toledo gave the same evidences of public indifference to appearances, although some were better than others. But the pavements were universally bad, the architecture was beneath contempt, and not more than a half-dozen really handsome houses were to be found in the whole list.

It would be interesting to know exactly what force has brought about so great a change in American cities. It has not taken place greatly in the smaller towns, and it therefore seems likely that the cities contain some element not often to be found outside of them. An increase in wealth will not account for it, since there has been no such increase per capita as is at all commensurate with the improvements which have taken place; for that matter, wealth alone could not bring it about. It must first have been desired, and the real question is what created the desire.

To ascribe the change to a cause, at first sight, so remote as asphaltum pavements may perhaps strike the reader as ridiculous; but let us consider. A badly paved street cannot be made to look clean and remain so, except at a considerable and constant expense; and, unless a street looks clean, it will not look well. The very hopelessness of the task caused it to be neglected. But, with the modern well-constructed asphaltum pavement, a highway came into being which could be cleaned at a reasonable cost, and therefore was cleaned. The first of these pavements in any city must have had its powerful and individual effect on those who saw it, and consequently on its neighborhood.

In all of the cities mentioned there was the same awakening, closely following the introduction of permanently smooth pavements—an awakening which soon possessed the whole body, and grew in strength as the possibility of satisfying the demand became more evident. Then came the inevitable. Mr. A. repaired his fence and bought a lawn mower; Mr. B. not only did that, but painted his house too; Mr. C. painted his house and added a bay window; each, not satisfied with emulating, but striving to surpass, his neighbors, until at last Mr. D. and the rest of the alphabet rebuilt entirely, on plans provided by an architect—for the contractor and builder could no longer rise to the occasion.

It is not intended by this argument to show that there have been no other causes at work towards this end; but, in view of what has happened in so short a time, the conclusion is unavoidable that smooth pavements have been a principal reason for the change, the magnitude of which could not have existed and continued without them as a governing factor. In each of these cities the general improvement followed and did not lead the construction of good streets, and the statement is probably true of the other cities in America.—Engineering Magazine.

Air in Radiators.

Water can absorb about one-twentieth of its volume of air, and all water which has not been boiled contains almost as much air as it can absorb. One pound of water at about 70 degrees occupies a volume of 0.016 cubic foot, or 2.30 cubic inches, and one-twentieth of this is 0.115 cubic inch. That is, one pound of water at ordinary temperature contains about 0.115 cubic inch of air. When water is converted into steam, the air which it contained passes off with the steam and occupies a volume which depends upon the pressure and temperature. In heating plants, the air which passes off from the boiler with the steam, or from the water in the case of a hot water system, goes into the mains, and finally into the radiators.

In the case of a hot-water heating system, it is very easy to handle the air and to avoid trouble. The air is so much less dense than the water that it always collects at the highest points of the pipes and radiators, and from there it is easily let off into the atmosphere by means of small pet cocks or air valves. Proper attention to the running of the pipes and to the location of the air cocks will enable a hot water system to be run without much trouble on account of air, as the air soon becomes driven off from the water or collected in the upper parts of the radiators, where it does little or no harm.

In a steam system of heating, air always collects in the radiators, and always gives more or less trouble. And the trouble never grows less, for even although the same water may be used over and over in the system, and by repeated boilings freed from air, it is still found that there is air in the system. Every time any of the radiators is cooled down, air enters and takes the place of the steam. This invariably happens, even when there are no air valves which open automatically when the radiators are cooled, because it has been found to be impossible, with the ordinary pipe fittings and valves, to install a system which will remain hermetically tight for any length of time. This means, then, that every time a radiator is heated up, at least once a day, the air in the radiator must be forced out before the radiator can be gotten thoroughly hot and made to work efficiently.

At atmospheric pressure and a temperature of about 70 degrees air is denser than steam at pressures ordinarily used in low-pressure heating apparatus; and even at the same temperature and pressure, air is denser than steam between 0 and 10 pounds gauge pressure. In order to make the difference apparent, the volumes of one pound of steam and one pound of air, with their relative densities, are given in the following table:

Gauge Pressure.	Temperature.	Volume of one pound of steam.	Volume of one pound of air.	Density of air divided by density of steam.
0	212°	26.6	16.8	1.595
2½	221°	23.0	14.6	1.575
5	227°	20.2	12.6	1.565
10	239°	16 3	10.4	1 567

From the table it is seen that the air in a radiator of an ordinary low-pressure steam heating system is, in round numbers, about 1.5 times as dense as the steam. That is to say, one cubic foot of the air in an ordinary radiator weighs about 1.5 times as much as one cubic foot of the steam in the same radiator.

In ordinary steam heating systems, where no special device or arrangement, other than the air valves, is used for freeing the radiators of air, the steam must displace the air and force it along through the radiator until it reaches an air valve, through which it can escape into the atmosphere.

Wall coils made up with return elbows give much more trouble than column radiators or than wall coils made up with manifold heads, simply on account of the much greater length of pipe through which the air must be forced in order to reach the air valves, which is usually attached to the return pipe at a point close to where it enters the coil. A short time ago I was asked to look over a heating system which was giving a lot of trouble on account of some of the heaters not getting hot and heating the rooms. I found that the heaters which were giving trouble were wall coils about 25 feet long, made up of twelve rows of 1¼-inch pipe, connected at the ends by return bend elbows. The air valve for each heater was at the end of a quarter-inch pipe, which rose from the return pipe close to the coil. It was apparent at once that the coils were air-bound. The steam had to force the air out of about 300 feet of pipe of each coil before it could circulate through it and get the coil thoroughly hot. The only way to get the air out was to close the valve on the return pipe and let the steam from the supply pipe force it out, and the friction was so great that a considerable pressure of steam was required to do this. There were in the same system a number of wall coils made up with manifold headers, but they gave little trouble, as the air had a less length of pipe to travel through in order to get to the air valve, and there was room in the headers for the steam and air to pass one another. The best thing to be done in this case was to take out the coils made up with return bends, and replace them with others made up with manifold ends. But this would have cost more than the owner cared to spend, and, therefore, the suggestion to put an air valve on each, or at least on every other, elbow of the coils was received with favor. The suggestion was received with even more favor when it was pointed out that by properly manipulating these air valves the amount of pipe in any of the coils which would get hot and emit heat could be regulated at will.

Air gives trouble even in the best forms of radiators, and when box coils or wall coils are used instead of radiators, great care should be taken to see that they are so designed as to give an easy egress to the air which is certain to get into them. They are used instead of radiators principally on account of their less first cost, but when they do not perform their proper function, *i. e.*, heat up and give out heat, they are dear at any first cost.

It is usual to lay all or most of the trouble which arises from air in radiators at the door of the particular form of air valve used, and, when a radiator becomes air-bound several times, the air valve is condemned, taken off, and then replaced by another. When the radiator gives no better service with the second air valve than with the first, the system of piping or the entire heating system is condemned, and the contractor comes in for his share of the blame.

The truth is that air is an extremely difficult thing to deal with in a heating system; it cannot be avoided, but must be met and gotten rid of. How and where to place the air valves are questions which require careful consideration; and then comes the consideration of the kind of air valve to use.

In the case of the ordinary column steam radiator, the air valve is usually placed on the last column about one-quarter or one-third the height of the column from the top. It is supposed that on account of its greater density the air, as it is displaced by the steam, falls to the bottom of the various columns, and that it is then gradually forced along in the base of the radiator to the last column, up which it rises. Now it is known, as a matter of experience and experiment, that air does accumulate in the upper part of the last column of an ordinary steam radiator, and the difference in densities of the air and the steam in ordinary radiators which are partially air-bound does not seem to be sufficient to make the steam rise to the tops of the columns and the air to fall to the bottom. And the fact that the air does rise to the upper part of the last column raises the question: Do those columns of the ordinary steam radiator upon which there are no air valves ever become entirely freed of air? If they do, it can only be through the steam on account of its less density rising to the upper part of each of them, displacing the air and making it fall to the base of the radiator. And if this takes place in some of the columns, it should be supposed that it would take place in all, not excepting even the last column. This line of thought leads us to suppose that better results would be obtained by placing the air valve of a radiator near the bottom of the last column rather than near the top. It may be claimed that steam enters the radiator through the return pipe as well as through the supply pipe, and that the air is forced to the upper part of the last column by the two bodies of steam coming from opposite directions. If it be granted that some steam does enter the radiator through the return pipe, and that the air in it is acted upon it by two bodies of steam coming from opposite ends, it would seem then that the air valve should be put upon one of the intermediate columns rather than upon one of the end ones. And finally, if the air collects in the upper end of the last column, it would seem that it would be better to put the air valve at the top of the column rather than about one-quarter the length of the column from the top.

We know very little about the behavior or distribution of air in radiators, and it is very difficult to obtain accurate knowledge in regard to either, because both the steam and the air are invisible and cannot be seen when in glass or other transparent tubes or flues, and when a pet cock on a column of a radiator is opened it is difficult to determine exactly where air ceases to escape and steam begins.

Many of the automatic air valves on the market make a peculiar ringing noise in addition to the hissing of the escaping air when the radiator is heating up, and are, therefore, objectionable in bedrooms. Many persons prefer a simple air cock to any form of automatic air valve for radiators in sleeping rooms.—J. H. Kinealy, in Heating and Ventilation.

The Amount of Nails Required.

In estimating the cost of work it is necessary that an approximate amount of nails required to complete the work should be known. Since the introduction of the wire nail, the number of nails required to do a given piece of work is not the same as when the barbarous "cut nail" was in vogue; therefore, the rules given for the latter will not apply to the former. The table given herewith is nearly correct, and is based on experience.

For 1,000 lath, it takes 5¾ lbs. wire lath nails.

For 1,000 shingles, 5 in. to weather, 5 lbs. shingle nails.

For 1,000 feet 6 in. sidings, 18 lbs. 2½-in. wire nails.

For 1,000 feet common boarding, 20 lbs. 2¾-in. wire nails.

For 1,000 feet rough boarding, 22 lbs. 3-in. wire nails.

For 1,000 feet square edge 1 in. flooring, 36 lbs. 3-in. wire nails.

For 1,000 feet square edge 2 in. flooring, 40 lbs. 4-in. wire nails.

For 1,000 feet matched flooring, blind nailed, 31 lbs. 3-in. wire nails

For 1,000 feet burring, 1 x 3 in., 42 lbs. 3-in. wire nails.

For 1,000 feet burring, 1 x 2 in., 60 lbs. 3-in. wire nails.

For 1,000 feet pine finish, 26 lbs. 2½-in. wire nails.

For 1,000 feet hardwood finish, 20 lbs. 2¼-in. wire nails.

For 1,000 feet studding in walls, 10 lbs. 3-in. wire nails.

For 1,000 feet rafters, cellar beams, 8 lbs. 3-in. wire nails.

For 1,000 feet common fencing, 12 lbs. 3-in. wire nails.

For 1,000 feet pantry fittings, shelves, hooks, strips, and similar work, about 5 lbs. 2-in. wire nails.

These figures are very nearly correct, sufficiently so to answer the purpose of the estimator. Of course, if the sizes of the nails are changed—larger or smaller—the figures must be changed to suit.—Clay Record.

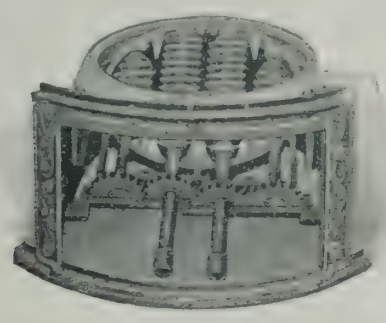
The Longest Asphalted Street in the World.

Philadelphia can boast of the longest asphalted street in the world. Broad Street has that unique distinction First, as already stated, it is the longest asphalted street in the world; secondly, it is the only street which is of even width for eleven miles, and this width is the greatest ever attained by any street for a course of eleven miles. It is also the straightest street, for from League Island to the county line it does not vary an inch, except where the great city building causes the street to turn around it. Seven miles of the street are asphalted, but the remainder is provided with a roadbed of fine macadam, which is continued by the old York road, which extends for about twenty miles farther on. A carriage can drive on this street and road and make only one turn in thirty-one miles. Broad Street is 113 feet wide, and measures 69 feet from curb to curb, and thirty-five men can walk abreast of it.

THE CARTON WARM-AIR FURNACE.

The Carton "L" Series Furnace is made in six sizes portable, and four sizes brick-set, with steel plate radiator 20 inches high. The entire body of the furnace is corrugated. A high ornamental shield front is used on the heater, which is entirely new.

The radiator is 20 inches deep, giving a very large amount of radiating surface and increasing materially the amount of direct fire surface by the increased depth of the gas-dome of the radiator. The radiator has a triple



radiating surface. The long revertible fire travel renders available the intense heat of the escaping products of combustion before they reach the smoke-flue.

The sectional firepot is divided at the center with a deep-cut joint, allowing the pot to expand and contract at this very vital point without danger of cracking.

The ashpit is of extra depth, and is provided with an extra large ashpit-door, allowing the grate to be dumped and drawn out.

The dust-damper prevents dust from escaping into the cellar when ashes are removed, or when the grate is turned.

The feed-door is extra large, making it convenient for stoking the fire, and is provided with a novel check draft.

The patent hexagonal grate used in this heater is a rotating bar dumping-grate. The bars are so constructed that air passes between and reaches the center of each, producing a more perfectly ignited body of coal than is possible where a solid surface of two or more inches extends through each bar, end to end, obstructing the draft, and consequently producing clinkers. The grate bars are suspended in a removable grate frame without bolts. The grate bars or frame can be easily replaced through the ashpit door. The grate is easily dumped in front,

THE CARTON WARM-AIR FURNACE.

and the grate frame is so constructed that each triangular bar has a center support, giving three supports to each bar.

The water-pan is so located that it can be easily filled or cleaned, and so arranged as to evaporate a sufficient quantity of water.

The clean-out plate for the radiator is conveniently located and easily adjusted, making the cleaning of the radiator an easy matter.

The makers of the Carton Furnace are the International Heater Company, Utica, N. Y.

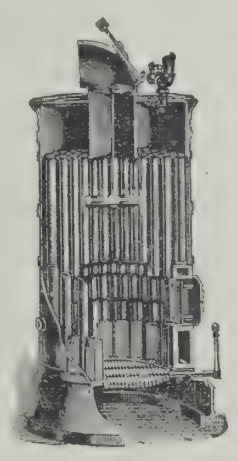
It is always gratifying to know that an American manufacturer has outdistanced most of his rivals in the particular branch of business in which he is engaged. The Randolph-Clowes Company, of Waterbury, Conn., manufacture seamless brass and copper tubes in all diameters, from one-eighth of an inch up to monster tubes thirty-eight inches in diameter. The largest tubes manufactured in Europe commercially are from twelve to fourteen inches in diameter; while of their American competitors, one firm has recently put in machinery for manufacturing nine-and-a-half inch tubes, and only one or two others make up to eight-inch diameters, while the rest content themselves with modest sizes of three or four inches. The Randolph-Clowes Company are the successors of the firm of Randolph & Clowes. Mr. George H. Clowes, whose untiring energy in the past brought the firm to its present high standing, built a commodious and well-equipped plant, unequaled in its particular branch. The president is Mr. Chauncey P. Goss, the manager of the Scovill Manufacturing Company, of Waterbury, who, however, takes no part in the active management of the concern that would interfere with his duties in connection with the Scovill Manufacturing Company. Besides seamless tubing, the Randolph-Clowes Company manufacture sheet brass and copper, as well as the well-known Brown's Seamless Copper Range Boilers and other plumbing specialties.

NEW HOUSE-HEATERS.

The "Equator" (steam) and "Gulf Stream" (hot water) house-heaters are a product of the Nason Manufacturing Company, 71 Beekman Street, New York, a firm founded in 1841 and identified conspicuously with the heating industry in the United States.

These boilers are the result of careful study of all the modern patented boilers, with a view to introducing a heater free from recognized defects.

In examining these heaters the manufacturers call attention to the following important features:



That the fire surface is large as compared with the grate area, averaging a proporton of nearly 40 to 1. This feature insures a rapid heater of the greatest obtainable efficiency.

That the surface is practically all exposed to the direct radiation of the fire. The surface is of the drop-tube type, and cannot become clogged with soot or become otherwise impaired, since it is self-cleaning.

That the fire-door is purposely larger than in most heaters of this type in order to make the feeding and care of the fire easier.

That the fire-box is deep and roomy, giving a large combustion chamber and liberal space for carrying coal over night.

That the grate used with these heaters, being of the shaking and dumping pattern, is easily operated and substantially made to withstand any usage to which it may be subjected. The grate is a vital part of any heater.

The heaters are equipped with the most modern self-controlling devices that can be obtained, and are entirely automatic in the control of their draft and fire.

The manufacturers publish an interesting pamphlet, which illustrates and describes their heaters in detail, and contains also a "Treatise on Steam and Water Warming, and the Selection of an Apparatus." This book has been written with great care, and as it is based upon an experience covering considerably more than half a century, it will be found to be of exceptional value to those interested in water heating. A copy of this book will be furnished by the Nason Manufacturing Company, 71 Beekman Street, New York, upon request.

"Pegamoid" is the latest successful application of the metal aluminium. Aluminium paint is washable, untarnishable, durable, easily applied, which looks like frosted silver. It opens a new field both to the professional and amateur decorator. It is invaluable for all decorative purposes, both exterior and interior.

The paint adheres evenly to, and can be used to great advantage on, textile fabrics and all pliable materials, such as leather, silk, or canvas, and the like. It presents a surface like porcelain, and will not crack, blister, or peel off.

It is unaffected by damp or extremes of temperature, and is anti-corrosive. It is not tarnished by sewer gas, and hence preserves its brilliancy where other paints change color. For bathrooms, stables, etc., it has no rival. As a waterproof coating it is unsurpassed. As the aluminium skin is not affected by lubricating oil, the paint can be used on cylinder heads and other bright parts of engines, machinery, and dynamos, thus saving labor in cleaning and greatly improving the appearance. Being unaffected by sea water, it is undoubtedly the paint for coating the bottoms of racing and other yachts. Aluminium can be applied to roofs by means of this paint, the long-sought-for solder for aluminium not being necessary. Owing to the reflection from the brilliant white surface, much less illumination is needed than when an ordinary paint is used. Surfaces painted with the aluminium paint can be decorated with tints, yielding most beautiful and striking effects and contrasts.

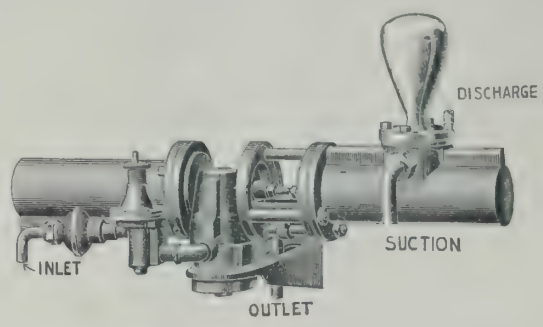
Aluminium paint can be applied in one operation without trouble or special preparation, and dries almost immediately.

The manufacturers are the American Pegamoid Company, 339 Broadway, New York.

THE EUREKA WATER-LIFT.

The Eureka water-lift, which we herewith illustrate, is a hydraulic engine, which derives its power from the city water pressure, and is used to elevate or lift soft or rain water to a tank, or force it directly into the house-pipes for domestic purposes.

The city water connects with the lift at the inlet, and after merging from a strainer and regulator, passes into the power-cylinder on the left, forcing the piston out. At the end of the stroke a shifting-valve is operated, which changes the water supply to another port, forcing the piston in the opposite direction and allowing the water already used to exhaust through the outlet. This double action causes a similar movement of a piston in the suction cylinder, which forces the soft water through the discharge either directly into the house-pipes or to a tank.



THE EUREKA WATER-LIFT.

It will be noticed that the power and suction cylinders have no direct connection with each other, thus preventing any possible mixing of the hard and soft water from leaky stuffing-boxes, and also rendering it possible to tighten the ports without taking the lift apart, which will be found of very great convenience.

Designed especially to force water directly into the house-pipes, and thus to do away with extra piping and a tank in the attic, these lifts are equally effective in pumping to a tank, and the plumbing necessary for their proper connection is reduced to a minimum, presenting no difficulties to any plumber.

The lifts are made in five sizes: Nos. 1 and 4 being compounded to give four feet of lift for every pound of water pressure, and Nos 2, 3, and 5, two feet of lift for every pound of water pressure.

Up to the limit of their capacity, Nos 2, 3, and 5, use only as much city water as they furnish soft water, *i. e.*, with a city water pressure of 25 pounds, the maximum lift would be 50 feet, and the maximum discharge would be 130,280 and 205 gallons respectively of soft water per hour, using the same quantity of city water to do the work.

The Bishop & Babcock Company, of Cleveland, with branches in Chicago and New York, are the makers of the Eureka lift.

A NOVEL WALL-PROTECTOR.

A Novel wall-protector has been invented by Richard L. Hardin, 1300 Michigan Avenue, Chicago, Ill., which is designed to prevent the soiling of wall decorations when cleaning windows, door frames, or base-boards. The wall-protector comprises a flanged blade or plate provided with a handle. The inner edge of the blade is brought against the window-casing and rests upon the wall. The blade is given an inclination to the woodwork

CLEANING THE DOOR-CASING, HOLDING THE PROTECTOR WITH THE RIGHT HAND.

to be cleaned, so that the water cannot flow behind the device. It should also be remarked that the protector may be held by one hand against the wall and in engagement with the woodwork to be cleaned, leaving the other hand free for cleaning. By using the wall protector it is possible to clean woodwork in much less time than has formerly been possible.

COLBY COMBINED STOVE-PIPE THIMBLE AND VENTILATOR.

The subject of the accompanying illustration is a combined stove-pipe thimble and ventilator, comprising a casing having a lower chamber open at both sides, through which the stove-pipe passes, and an upper chamber, also open at both sides. A flap is pivoted within the upper chamber so as to cover one opening, its lower edge normally extending below the lower edge of the other opening to prevent the gas in the flue from passing backward into the compartment.

COLBY COMBINED STOVE-PIPE THIMBLE AND VENTILATOR.

The high temperature in the kitchen pipe induces a constant current of air into the ventilator, which current is upwardly deflected in such a manner that it enters the chimney-flue at a point much above the pipe collar, and with an onward impulse. This air, it is claimed, being at a high temperature, will actually increase the draft of the stove by the strong upward current which is at once established.

The device removes all objectionable odors, heat, steam, and gases from rooms, kitchens, and laundries, and increases the draft, as already mentioned. Further information may be obtained from John McCoy, 31 Dearborn Street, Chicago, Ill.

One of the largest and most carefully prepared catalogues of its kind has recently been issued by the Yale & Towne Manufacturing Company, 9-13 Murray Street, New York city. The volume includes only goods of the company's own manufacture, and presents a complete line of builder's hardware—probably the largest of its kind in the world. The catalogue includes illustrations and descriptions of the famous Yale locks; "Vulcan" locks, with which are associated a very extensive series of attractive ornamentations; and "Brandford" locks and hardware. The characteristics and quality of the company's various products have been long well established. The new 1899 catalogue retains the feature of half-size illustrations, first introduced in the 1893 volume. Concentration has been sought by avoiding all needless variations of goods, and by using only a single cut to illustrate goods which differ merely in size. By this means the volume has been kept within the compass of 883 pages; whereas, if compiled on the usual plan and illustrated with full-size cuts, at least 2,000 pages would have been required.

An Efficient Staved-Up Column.

In our August number we published a cut of the Atlantic Yacht Club, at Sea Gate, Norton's Point, L. I., showing some fluted columns 2 ft. 6 in. diameter of shaft, by 30 ft. long.

Our curiosity was excited as to how these were made, and on inquiry it was found that they were staved up, of dry white pine, by the Standard Wood Turning Company, of Jersey City, N. J.

By the aid of special machinery the company manufacture columns in this way from 10 inches diameter of shaft to any size, at less cost than they could be turned from solid squares, which, in these large sizes, are never dry, and therefore are liable to check badly.

Each cut of the machine makes a stave with the miters and the proper taper, there being no waste but the sawdust. These staves are mitered together, glued and nailed around the blocks for ordinary length columns one at each end and one in the center to stiffen them. The columns are then turned in the usual way and given a priming coat of paint. The joints are well made.

The Kenney "Flushometer," an ingenious little mechanical appliance for flushing water-closets, which effectually dispenses with the noisy overhead tank, has, in competition with other devices for the same purpose, carried off the palm with William Cramp & Sons, Philadelphia, Pa., and the Morse Iron Works, New York city. The former installed seventy-seven Kenney "Flushometers" on the U. S. transport "Thomas," and the latter 60 on the transport "Logan." The Kenney Company, manufacturers of this device, are located at 72-74 Trinity Place, New York city.

A Book on Drainage.

By writing to John H. Jackson, Albany, N. Y., a book full of sensible suggestions to farmers and gardeners may be obtained free by persons living in the New England, Middle Atlantic or adjoining States. This book points out practical ways of greatly increasing the value of land, by the intelligent use of under drainage, not only in bog and other wet, waste places, but in much of the higher ground which farmers would be glad to improve if they could do so at a reasonable cost. The book is popular in its style and yet thoroughly scientific and careful in its statements and conclusions. It advocates the use of the round tile made by John H. Jackson, of Albany, not only for drainage but for irrigation as well.

A section of water pipe, 30 feet long, was taken up at Rochester, N. Y., recently, which was laid twenty-five years ago. It was a thin, riveted wrought iron pipe, one-eighth of an inch in thickness, and was laid in 1874 by Thomas Leighton as a portion of the 24-inch supply pipe from Carroll to Fitzhugh race to the Holly pumping station. The pipe was practically as good as when it was laid twenty-five years ago, and the general opinion of the experts was that if it should be replaced it would last as long again. The pipe was made for another use, but the contractor, having it on hand, used it for the above purpose. Chief Engineer Kuichling has caused photographs of the pipe to be taken and a record of the cost of the pipe, its use and its condition will be made.—Municipal Engineering.

THE SURFACER USED BY THE LARGEST MILLS IN THE WORLD.

The unusual demands made upon planers, particularly by the large-box factories of the Pacific Coast and Southern lumbermen, have been such as to require a better, more substantial and durable machine than has heretofore been built. The planer illustrated is designed to do the greater quantity of heavy or light surfacing in hardwood or pine. Every weak feature that experience has developed in all other planers will be found completely overcome. Every practical improvement known is embodied in this machine.

The main frame is unusually strong and heavy, cast in cored sections, with heavy cross girts and broad base.

The bed is made with a heavy deep web, and is fitted into the main frame in four long, dovetailed ways by strong, adjustable gibs. It can be raised and lowered on four powerful screws, one at each corner of the bed, and can be instantly stopped by means of friction feed, and started by means of one lever at the front of machine, or adjusted by hand by large wheel at front of machine. The four screws run in ball-bearings, making the raising and lowering of the bed a matter of the greatest ease.

There are six feed-rolls, 8 inches in diameter, powerfully driven; all rolls have parallel lift, so as to give full bearing across the entire width of the material being planed. The two upper rolls and chip breaker before the cylinder are divided, and each section of the rolls is separately driven and separately weighted. The lower rolls are driven by large expansion gearing, avoiding bevel gears or universal joints. Friction-rolls are also fitted in each end of the bed.

The feed is driven from the cylinder, and is thus always controlled by its cutting velocity, increasing and diminishing according to the speed of the cylinder. It is at the instant control of the operator, started and stopped by means of a ring friction, possessing adjustment for wear. As many speeds of feed can be furnished as may be desired.

The cylinders are solid steel forgings, three sided, and slotted for three knives. The journals are two and a quarter inches in diameter, run in boxes ten inches long, are lined with the best material, are ground perfectly true, and are self-oiling, so as to supply oil to the journals continually.

The lower cylinder, with its bearings, is mounted in a long, dove-tailed slide, which may be quickly drawn out at the side for sharpening and resetting the knives.

The pressure-bar, after the upper cylinder, is arranged to act as a bar over the lower cylinder, and adjusted by means of a small hand-wheel at the side of the machine, thus avoiding separate adjustment.

The lower cylinder bed-plates for same and lower feeding-out rolls are very conveniently adjusted to regulate the depth of cut.

The builders of this new machine are the Egan Company, No. 209 to 229 West Front Street, Cincinnati, Ohio.

Dampness of Walls and the Preservation of Microbes.

It is a matter of general interest to know how long disease germs will remain in a contagious condition in a house when the latter has not been thoroughly disinfected.

Some special investigations have been made on this point by M. Vito lo Bosco, a hygienist of Palermo, Italy, says L'Illustration. The investigations were made of the walls of dwellings exclusively, as the floors are generally easily cleaned and disinfected,

The life of the pathogenic germs was found to vary greatly with the different materials of which the walls were constructed, and especially according to their degree of dampness or dryness.

As a general rule, walls covered with stucco or varnish were found least favorable for prolonging the life of the microbes, and walls which are normally dry possess to a considerable degree the power of self-cleansing. The typhoid bacillus, the cholera germ, the diplococcus of pneumonia, when placed on such walls, die after twenty-four hours at the maximum, and the diphtheria bacillus survives only seven days. The tuberculosis microbe only can remain alive for two or three months. On well-dried size, however, it survives even four or five months.

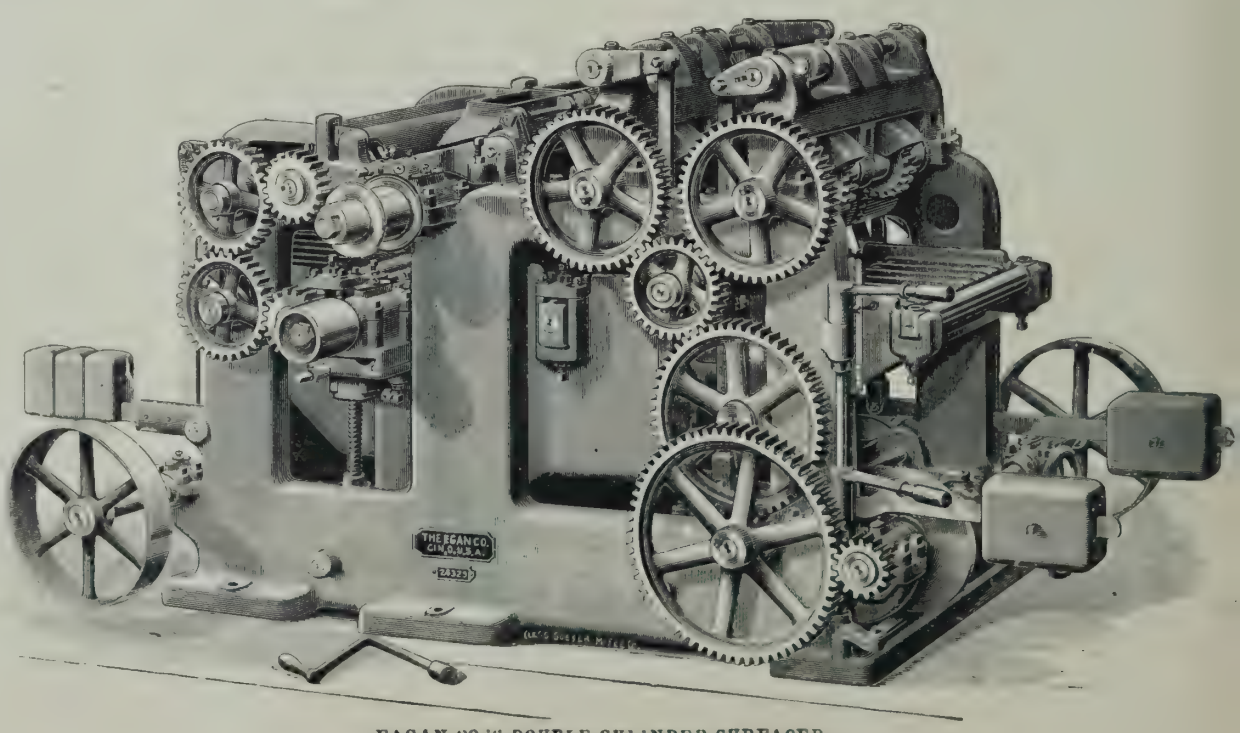
Damp walls, on the contrary, cause the vitality of bacilli to increase, and this to such a degree that the period of life of some under these conditions has not yet been determined. The microbe of typhoid fever, for instance, remains alive three days, that of diphtheria a month, and that of pneumonia from fifteen days to three weeks.

The knowledge of these facts should bring about useful practical applications,

The dampness of dwelling houses appears doubly dangerous, first, in itself, and second, because of the long life which it gives to the elements of contagion and infection.

Contrary to the traditions of the elegance of dwellings, which cause the walls to be covered with tapestry or paper in imitation of it, scientific experience would advise the employment of stucco or good varnish, which are best from a bactericidal point of view, both because they are easily washed and because they possess the property of cleansing themselves promptly and spontaneously of pathogenic germs which become lodged on them.

The Fox Machine Company, of Grand Rapids, Mich., have sent us a little catalogue illustrating "Fox-All-Steel" Sash Pulleys, Post-Boring Machines, and three and four hole bits. We have already described the Fox pulley in these columns and dwelt on its merits at length. But still further information can be obtained from this neat little pamphlet



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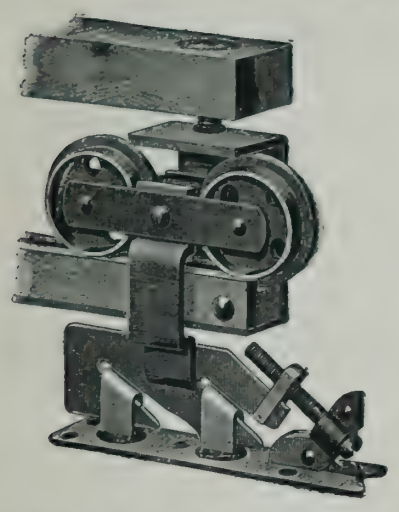

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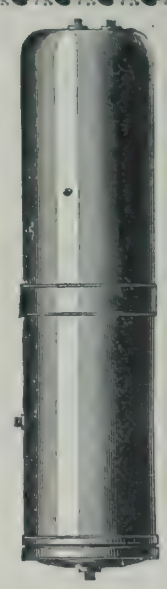

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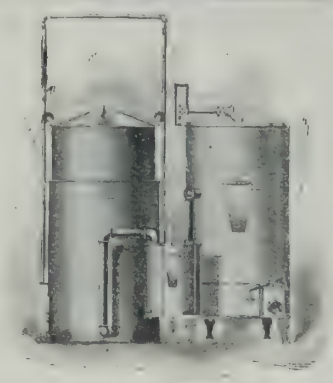

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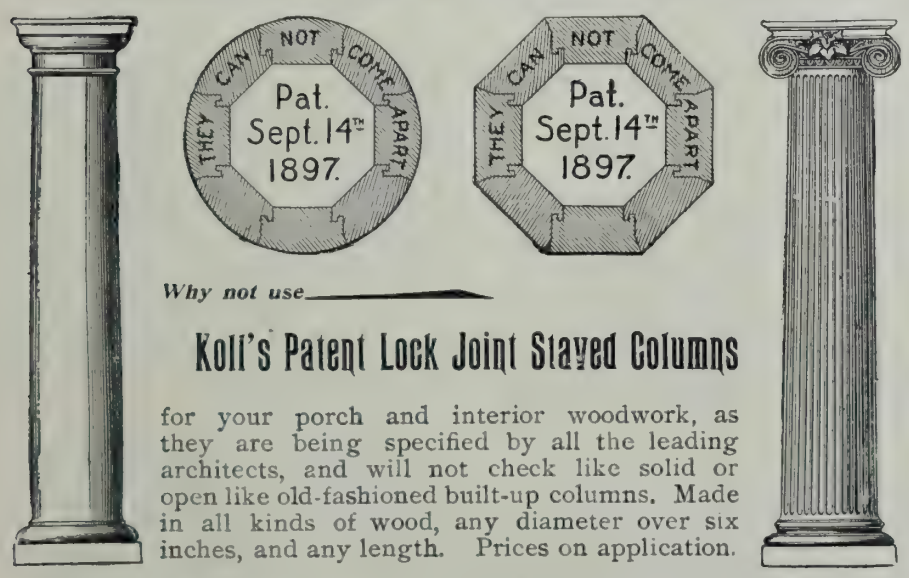

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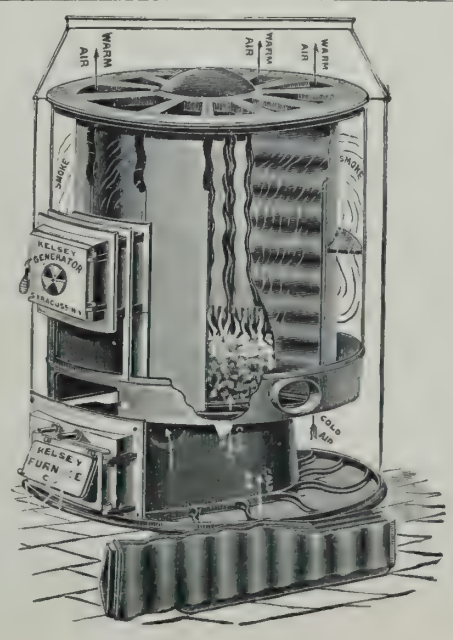

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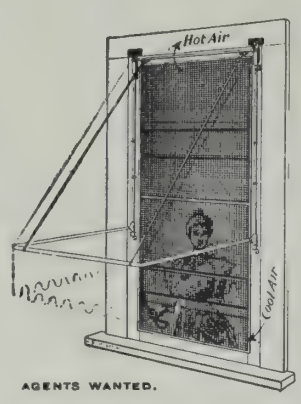

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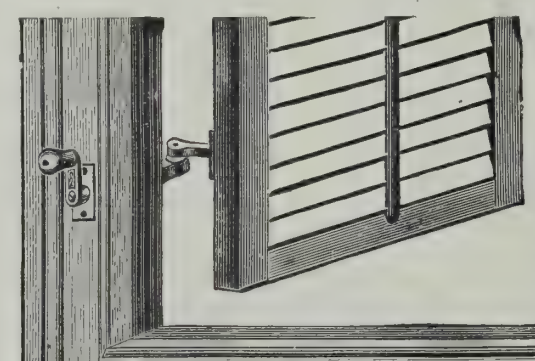

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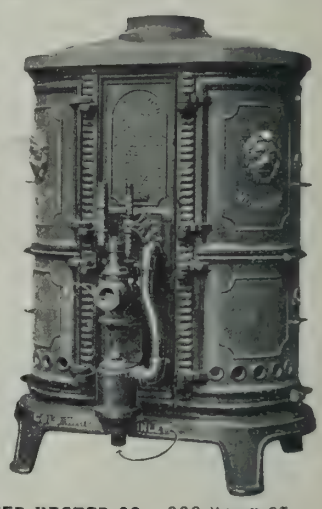

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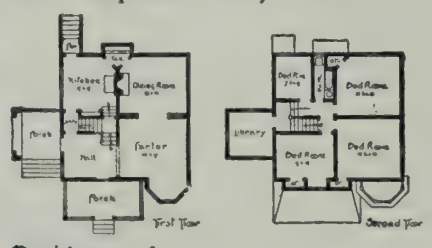

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AN INTERNATIONAL COMPETITION.

IN the early part of last year the regents of the University of California sent out invitations to the architects of Europe and the United States to participate in a competition, the motive of which was to secure the best possible plans for the new buildings contemplated for the University. The general details and future requirements were succinctly stated to all who expected to enter into the competition, and as the cost of the proposed buildings was limited only by millions, it was believed (and in this respect there was no disappointment experienced) that the leading artists of the world would not only lend to the competition their moral support, but would eagerly embrace such an opportunity to add to their personal fame and distinction.

The arrangements were devised with great care and attention to detail. Nothing was omitted that would assure a perfectly fair competition, and the susceptibilities of the participants were carefully considered.

In deference to the convenience and wishes of the great Continental architects, the city of Antwerp was chosen as the place where the first or preliminary competition should be held. The authorities of that city were most kind in every way, and gave the Royal Musée for the exhibition. One hundred and one plans were received by the committee from every nation of Europe, and many from the United States. On October 4th, the Judging Committee, which consisted of Norman Shaw, R. A., London; M. Pascal, Paris; Professor Wallot, Dresden; Walter Cook, New York; and J. B. Reinstein, San Francisco—gentlemen whose reputation as individuals and eminence as architects were absolute assurance of competence and impartiality—decided that, of the plans shown at Antwerp, eleven were entitled to enter the final competition. The successful ones were those presented by Barband and Banhain, Paris; E. Bénard, Paris; F. Blundschi, Zürich; D. Despradelles and Stephen Codman, Boston; Rudolf Dick, Vienna; J. S. Friedlander, New York; Herand and Eichmuller, Paris; Howard and Cauldwell, New York; Howells, Stokes and Hornbostel, New York; and Whitney Warren, New York.

To the successful ones of the preliminary competition a cash reward of $1,200 was made, and in addition a sum sufficient to cover the expense of the journey to San Francisco, and an opportunity of studying in person the site which the new buildings were to occupy

Their success carried with it the privilege of entering into the final competition, besides, in case of securing the prize, the distinction and profit gained in the erection of the new buildings.

Most of those who were successful at Antwerp have within the past year visited the Pacific Coast, and enjoyed many civic and professional attentions while in San Francisco.

The date for the final competition was set for September 1st, and prior to that time plans from all the participants had been received.

The new ferry building with its roomy nave was chosen for exhibition purposes. Each plan was displayed to the best advantage. As the committee had no means of identification the absolute impartiality of the decision was assured. The plans were all on so vast a scale, and the details of each were so carefully worked out, that a minute study of every plan was a matter of exhaustive care on the part of the committee and consumed much time. A week was required, working night and day, before a decision was at last reached, and on Friday, the 8th of September, the announcement was made that the plan of E. Bénard, of Paris, had won the first prize, and the reward of $10,000. The choice was unanimous, and is indorsed by the local profession as evidently just and undoubtedly correct. The eminent appropriateness of Monsieur Bénard's plan may be better understood when the peculiarities of the site are known.

The University occupies a tract extending east and west, and in extent 245 acres, sloping from the crest of the coast range, an elevation of perhaps 1,300 feet, down to a point only a few feet above the bay. The range is quite precipitous in its upper part, though the area of gentler sloping land is quite extensive. Naturally, at the highest point is the Astronomical observatory, and with that as a starting point the great group of buildings will occupy a vast rectangular, separated by lawns and wooded groves, and descending terrace by terrace. To fully carry out the plans to the ultimate twenty more acres will have to be acquired, 265 in all.

The triumph of M. Bénard is that of the French school of which he is the greatest living exponent.

The committee upon whom rested the responsibility of a decision was identical with that at the preliminary competition, excepting that Mr. John Belcher, of London, was substituted for Norman Shaw, who was prevented by professional engagements.

The committee in its discretion announced the award of four other prizes to the competitors, who, it is gratifying to note, are all from America.

The second prize of $4,000 was given to Howells, Stokes and Hornbostel, of New York; the third prize of $3,000 was awarded to Despradelles and Codman, of Boston; the fourth of $2,000 to Howard and Cauldwell, of New York; and the fifth of $1,000 to Lord, Hewlett and Hull, of New York.

The winner of the first prize, M. Bénard, was born in Goderville, Department of the Seine Inférieure, in 1844, and is one of the first architects of France. In 1867 he won the Grand Prix de Rome. He was once the architect for the City of Havre, where he designed the great warehouses for the docks. He planned the Tribune of Commerce at Fecamp, the restoration of the Château de Sasselot, and churches at Bleville and Mare-aux-Clercs, besides important works at Nice and Paris.

The competition which has thus closed was made possible through the generosity of Mrs. Phœbe A. Hearst, the widow of the late United States Senator Hearst, and the possessor of large wealth. This lady gave $100,000 for defraying the necessary expenses, and this amount and more has already been absorbed. Mrs. Hearst is a regent of the University of California, and has signified her intention of immediately providing for the erection of more than one of the new buildings, and to give such an impetus to the whole project outlined in the plans adopted as to insure its completion before the conclusion of another generation. Fully $20,000,000 will be required, a sum that is large for any community to put into stone, brick and mortar for educational buildings, but which will give California very little concern. A very large proportion of this amount is already provided for.

MOORE'S GOTHIC ARCHITECTURE.

IN 1890, Charles Herbert Moore published the first edition of the "Development and Character of Gothic Architecture," and now Messrs. Macmillan and Company have published a second edition which has been rewritten and enlarged. This book is one of the most important contributions ever made to the history of architecture. The author's conclusions were so radical that they were unwelcome to many English readers who had regarded Gothic architecture as a no less English than Continental product, and the whole subject was discussed at considerable length by the author and the editor of the "American Journal of Archæology." In his attempt to set forth the development and character of Gothic architecture, the author uses the term "Gothic" because it has been established by custom, and because, since it was owing to the infusion of Northern genius that the style was brought into being, it was not entirely an inappropriate term. He uses it, however, in a restricted sense, confining it to that style of the Middle Ages which was the fullest development of the new principles, and most distinctly a mediæval product. In thus restricting the term he was forced to exclude the greater part of what has usually been called Gothic architecture because of its failure to exhibit those qualities of design and construction which characterize the distinctive style. The general term "pointed architecture," he considers, will suffice to include the other classes of monuments which have hitherto been erroneously classed with the Gothic.

Mr. Moore's position differs considerably from what has hitherto been maintained, specially by English writers. In the works of true Gothic style we have a new structural system carried out with the strictest logic and with a controlling sense of beauty. They are indeed works of the highest art, in which sound mechanical principles serve as a secure foundation for the exercise of poetic imagination. Mr. Moore states and shows by means of elaborate diagrams that Gothic architecture under his definition was never practiced elsewhere than in France. He says, "Yet from this position I can see no escape," and a careful perusal of his book with the elaborate diagrams and logical arrangement of facts will also lead the reader to believe in the soundness of his views.

The French origin of Gothic architecture is now indeed pretty well admitted on the Continent of Europe, but the exclusive claim that the architecture of France in the Middle Ages should be called Gothic is a new idea of the author. This being the case, nothing short of a close analysis and comparison of the different pointed styles of Europe could be expected to establish a view so different from that which has commonly prevailed. Mr. Moore has made an examination of the architecture of the twelfth and thirteenth centuries, and he illustrates the results of these examinations in a clear and intelligible manner and presents his facts in such a way that the monuments really speak for themselves.

The very name Gothic originated in a spirit of contempt. The architects and amateurs of schools of Vignola and Palladio, where the refining taste for antique art had led to an abandonment of mediæval forms of designs, could not be expected to admire anything so far removed from the spirit of the art which was in fashion during the sixteenth century. That this distaste of pointed architecture should be felt in Italy was not unnatural, for it was really foreign to Italian genius and Italian traditions. The use which Italian builders made of pointed arches shows how little it was suited to their needs. Mr. Moore considers that the usual conceptions of the nature of Gothic art are inadequate. In architecture the principles of construction are fundamental. Gothic architecture differs from arched Roman and Romanesque far more fundamentally than by the use of the pointed arch or by the substitutions of one type of ornament for another. A new principle was introduced into the art of building when the arch having side thrusts was first employed. The most economical and effective way to resist such thrusts is by some kind of external abutments, but the thrusts of the arches may be neutralized in another way—namely, by downward pressure upon the walls or piers against which they operate. Both methods were employed by the Roman and by the Romanesque, as well as by the Gothic builders. The Romanesque builders of northern France devised many structural improvements, but we are still far from the Gothic system. The inert transept of the ancient Roman design still largely survives. The heavy vaulting, massive walls and small openings of this Romanesque architecture are opposed to the principles of Gothic, but the system was quickening with a latent life which ultimately transformed the structure and gave it a radically new character and expression. From this stage the evolution of the Gothic style consisted in gradually perfecting the rudimentary skeleton so as to make it independent of the heavy walls. To every part the highest working efficiency was finally given together with an appropriate artistic form. All this was rendered possible by the introduction of the pointed arch, which was not originally employed on account of an æsthetic preference for this form of arch, but as a constructive device in vaulting.

The general form and constructive character of a developed Gothic building is summarized by Mr. Moore as follows: In general the plan consists of a central nave, the eastern portion of which forms the choir, with the side aisles, sometimes one and sometimes two, on either side; the transept was also usually provided with aisles. The choir terminates in a segmental or polygonal apse, around which the aisles are continued. Opening out of the apsidal aisles are usually a series of small chapels. The nave is divided from the aisles by a row of piers on each side, which support the superstructure, consisting of the triforium and the clerestory. On the outer sides the aisles have half-piers, or responds, against which are set the great buttresses of the interior, and the spaces between them are enclosed by low and comparatively thin walls, with openings above them reaching from pier to pier, and up to the arch of the vaulting.

The vaults whose forms and proportions determine the number and arrangement of the piers and buttresses are constructed upon a complete set of salient ribs, transverse ribs, diagonal (or groin) ribs and longitudinal ribs. These ribs are independent arches, of which the transverse and longitudinal ones are pointed, while the diagonals sometimes remain round. Now upon these ribs rest the vaults, one never being incorporated with the other. The ribs are sustained by slender shafts compactly grouped, and are bonded at the base and the capitals with the great piers which rise from the pavement through the successive stories of the building to the nave cornice. Shorter shafts carry the archivolts (arches of the main arcade), the ribs of the aisle vaulting and the arches of the triforium. To the pier is added a rectangular buttress, which rises through the triforium and becomes an external feature in the clerestory. Each pier is therefore a compound member, consisting of a great central column with which are incorporated smaller shafts and a buttress. By these piers the vaults are supported, their thrusts being so completely neutralized by the external

buttress system that they require to be only massive enough to bear the weight of the vaults. The clerestory buttresses are re-enforced flying buttresses, which are segments of arches rising from the vast outer abutments (the external members of the responds of the aisles) and springing over the aisle roofs. These flying buttresses are the most characteristic features of the Gothic exterior.

Mr. Moore then deals with the walls, and to us it seems that this is the most interesting part of this masterly definition of the Gothic. The walls proper are not entirely omitted, and those that are retained are the low enclosing walls of the ground-story and the spandrels of the various arcades. The spaces between the piers and beneath the arches of the vaulting in both the clerestory and aisles are entirely open, like the intercolumniations of a colonnade. They are formed into vast windows divided by mullions and tracery. The active principle introduced by the flying buttress, as opposed to the comparatively inert principle of the Romanesque wall and the wall buttress, is the distinguishing principle of Gothic construction. By the flying buttresses in connection with the pointed arch in the ribs of the vaulting and a peculiar adjustment of these ribs is the Gothic concentration and resistance of the thrusts rendered possible. Such is in brief the author's definition of Gothic architecture. With these premises Mr. Moore deals with the sources of the Gothic, and then takes up Gothic architectural construction in France, and deals with the subject with the aid of elaborate diagrams. Clear cut arguments carry the reader with the author, and no one can close the covers of this most important book without receiving a splendid idea of the principles which underlie Gothic architecture, which was germinating by the beginning of the 12th century, which had accomplished its structural transition in the third quarter of the century, and had reached its fullest perfection by 1220. Of the pure French Gothic of the 12th century, says Mr. Moore, "it is hardly too much to say that it is the most splendid architectural product that human genius and skill have thus far wrought in this world."

ARMORY OF CASTLE OF VINCIGLIATA.

A RESIDENCE AT SPRINGFIELD, MASS.

WE present on page 85 in this issue a residence which has been erected for Dr. Francis M. Bennitt, at Springfield, Mass. The design is architecturally good, and is treated in the Elizabethan style. It has a combination of excellent features, both externally and internally, while the whole is most complete. The underpinning is built of red brick, laid up in red mortar, and the chimney is built in a similar manner. The exterior is covered with sheathing paper, and then shingles, stained a dark brown color with bottle green trimmings. The gables are beamed and paneled and filled in with stucco-work. The roof is shingled. Dimensions: Front, 46 ft. 6 in.; side, 43 ft., not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The interior is most excellently arranged, and it is finished off in a very handsome manner. The entrance is through a vestibule, paneled with oak and provided with tiled floor. The hall is trimmed with oak, and it has a paneled wainscoting and ceiling beams, and it contains an open fireplace built of brick with tiled hearth and facings, with wrought iron trimmings, and a massive oak mantel with columns. The staircase is one of handsome design, with massive newel posts treated in the English style, and is lighted effectively by a cluster of stained glass windows. This staircase hall is separated from hall proper by an archway with pilasters with carved caps. The parlor and library are trimmed with cherry, and the former contains an open fireplace trimmed with tiles, and mantel of cherry, with mirror. The library has a bay window thrown out with seat. The dining room is trimmed with oak, and it contains a paneled wainscoting and ceiling beams. The butler's pantry is fitted up with bowl, cupboards, dressers and closets. The kitchen and its apartments are wainscoted and are furnished with the best modern conveniences. The second floor contains four bedrooms with large closets, nursery, and bathroom, wainscoted in oak, and furnished with porcelain fixtures and exposed nickelplated plumbing. These apartments on this floor are treated with cherry and white enamel. The third floor contains two bedrooms, trunk room, bathroom and billiard room. A cemented cellar contains furnace, laundry and other necessary apartments. Cost complete $9,000. G. Wood Taylor, architect.

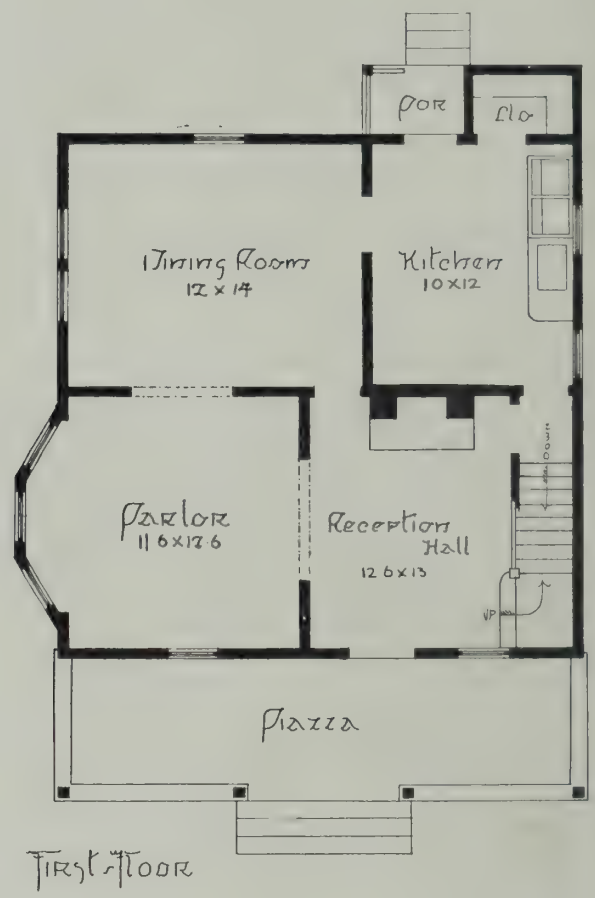
Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

THE CASTLE OF VINCIGLIATA.

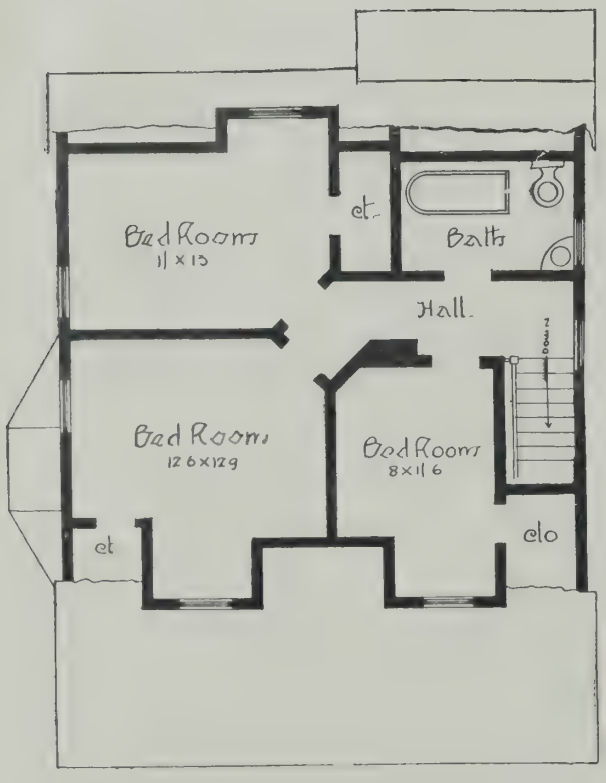
THE interior of all fine mediæval buildings is nearly always very interesting, as indicating the possibilities of decoration in modern rooms which lend themselves by their size to mediæval treatment. We have illustrated some interesting features of the Castle of Vincigliata, and now, on page 81 and above, present engravings giving an excellent idea of the living rooms of mediæval strongholds where the lord of the land lived sumptuously. The country around Florence is particularly interesting, and on a beautiful spot on a hill near Fiesole is the charming Castle of Vincigliata, which is owned by an Englishman, Mr. John Temple-Leader, who has restored it to the original condition in which it was when the castle was a feudal stronghold. It is rarely nowadays a castle can be seen which in any way approximates its condition in the mediæval times, and it is all the more interesting and important on this account. It stands on arid and rocky ground, and its battlemented frowning walls form a prominent object in the landscape. The road from Florence rises steeply beside plantations of fir and cypress until the very walls of the mediæval fortress are reached.

The first record which we have of the castle dates from 1031, and in 1061 it passed to the family of Visdomini, and finally to the famous family of Albizzi. When Mr. Temple-Leader purchased it in 1827, it was in a ruinous condition, but the young architect whom he employed studied the old records and ancient edifices until he had succeeded in making a thoroughly adequate restoration, so that to-day Vincigliata is the Vincigliata of six hundred years ago, when it opposed itself to the assaults of foreign foes and hostile neighbors. It is now a real museum of the Middle Ages, and shows that, notwithstanding the fact that it was a fortress with frowning towers and battlements, it was also adapted for common uses, and it was famous in the annals of Florence. Every piece of furniture in the group of buildings was carefully selected, and even the utensils in the kitchen and dining-rooms are veritable antiques or modern facsimiles of the best old examples. The courtyard of the castle has on one side a pillared loggia, and the armory which opens into the courtyard has a well 240 feet deep.

The armory shown in the above engraving opens into this courtyard. Here are complete sets of armor down to the smallest detail, and around the walls are pikes, halberds, scythes, flails, rapiers and other instruments of destruction with which the mediæval warriors liked to amuse themselves. The dining-room is even finer, the vaulted ceiling being decorated with armorial bearings. The huge table has undoubtedly served on many occasions for many pleasant feasts, for when a function of this kind was to be given at the castle, friends from the city attended the same, as we now go out to country houses. The decorations of the dining-room are in admirable taste, and should prove valuable to any architect who has a large dining-room to decorate.



First Floor

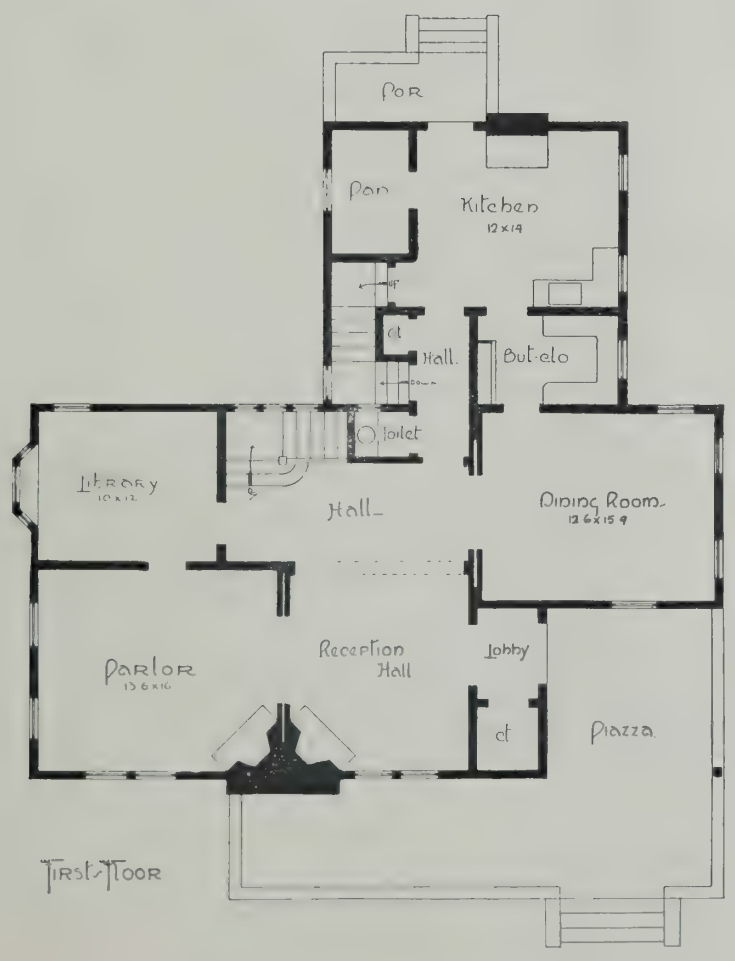


Second Floor

BOSTON PUBLIC

A MODEL COTTAGE AT NUTLEY, N. J.—See page 98.

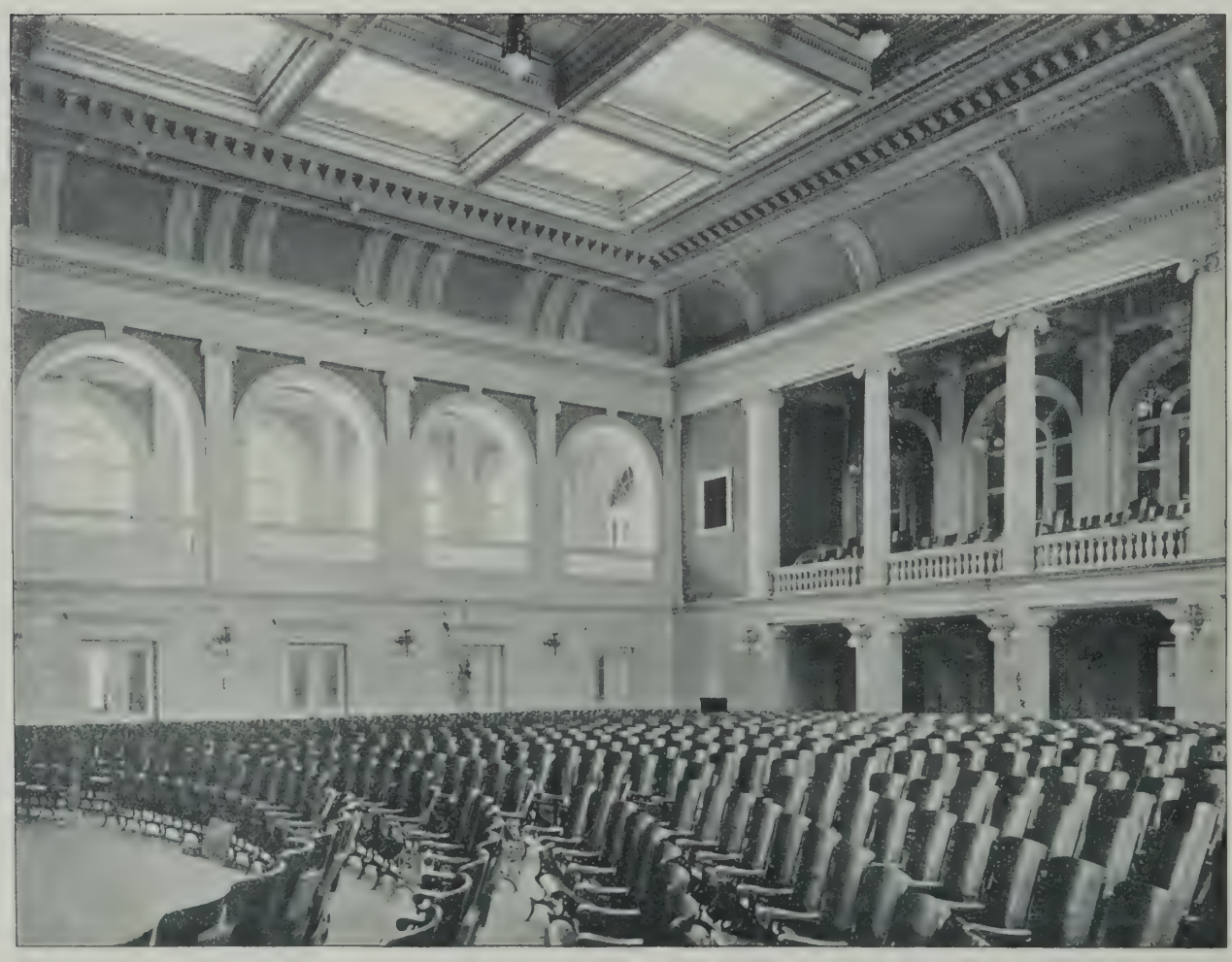
MR. W. A. LAMBERT, ARCHITECT.



A RESIDENCE AT SPRINGFIELD, MASS.—See page 83.

MR. G. WOOD TAYLOR, ARCHITECT.

VIEW OF BUILDING.

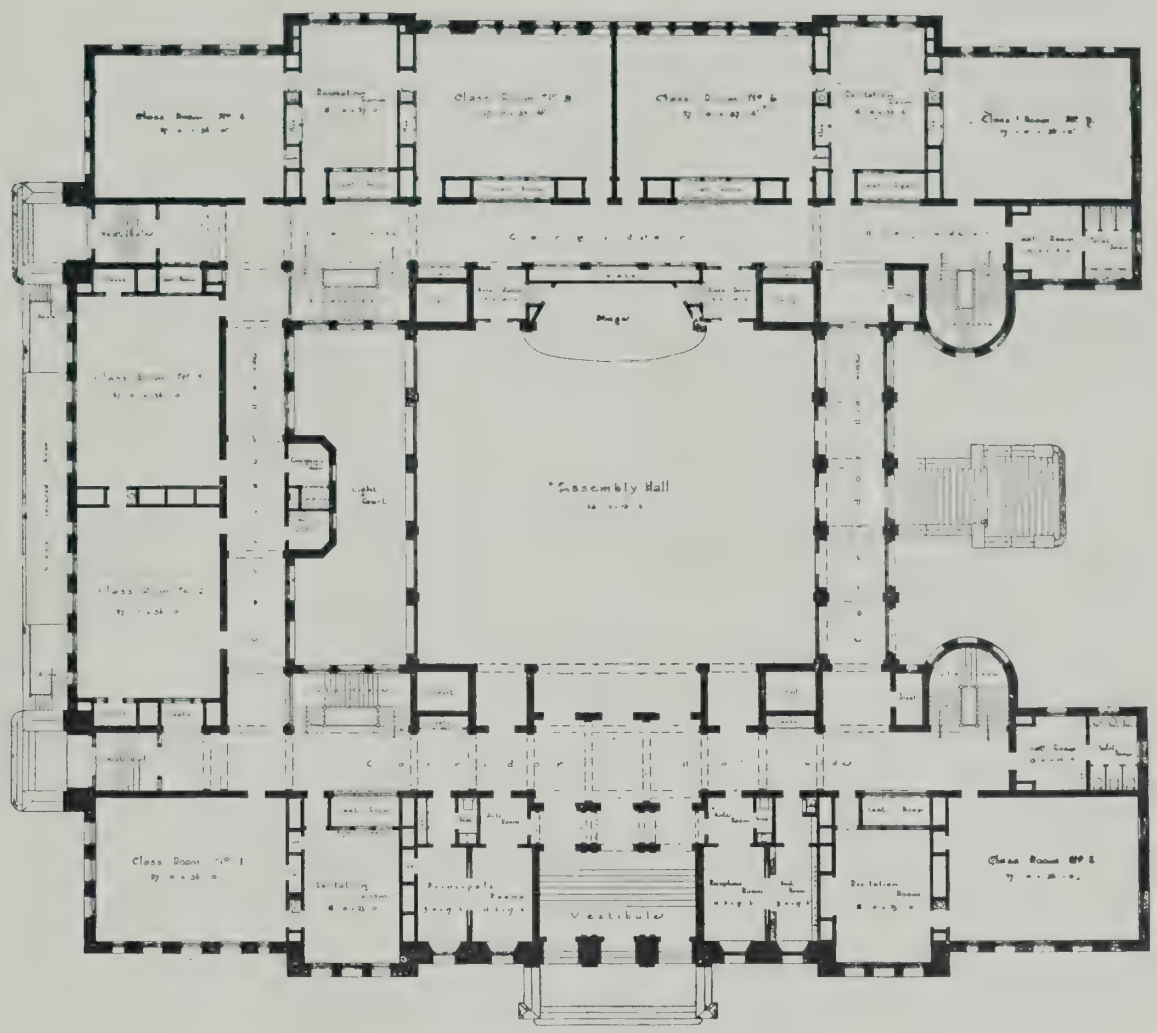


ASSEMBLY HALL.

BOSTON PUBLIC LIBRARY

A MODERN HOUSE OF LEARNING AT SPRINGFIELD, MASS.—See page 96.

MESSRS. HARTWELL, RICHARDSON & DRIVER, ARCHITECTS.



PLAN.

VIEW OF ENTRANCE.

VIEW OF OBSERVATORY.

A MODERN HOUSE OF LEARNING AT SPRINGFIELD, MASS.—See page 96.

MESSRS. HARTWELL, RICHARDSON & DRIVER, ARCHITECTS.

A MODERN RESIDENCE AT BENSONHURST, L. I.—See page 97.

MR. JOHN J. PETIT, ARCHITECT.

A Floral Pathway.

Mr. W. Goelet's Garden.

Mr. H. A. C. Taylor's Lodge.

Mr. E. D. Morgan's Residence

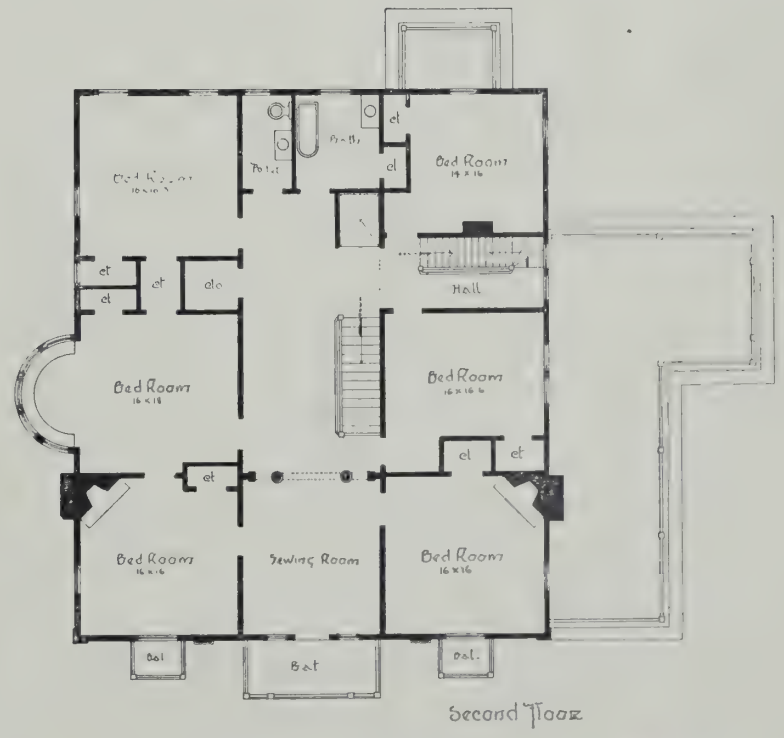
Mr. E. Winthrop's Italian GARDEN.

SOME FORMAL GARDENS OF NEWPORT.—See page 97.

BY MISS MARGRET LA FARGE.

A COLONIAL RESIDENCE AT WEST NEW BRIGHTON, STATEN ISLAND, N. Y.—See page 97.

MR. JAMES WHITFORD, ARCHITECT.

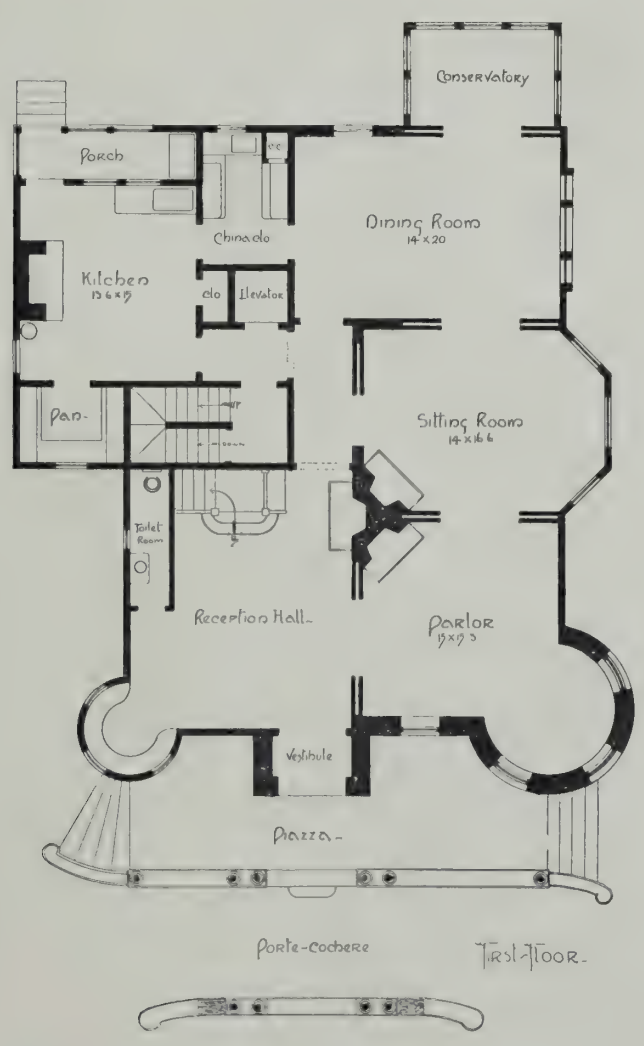


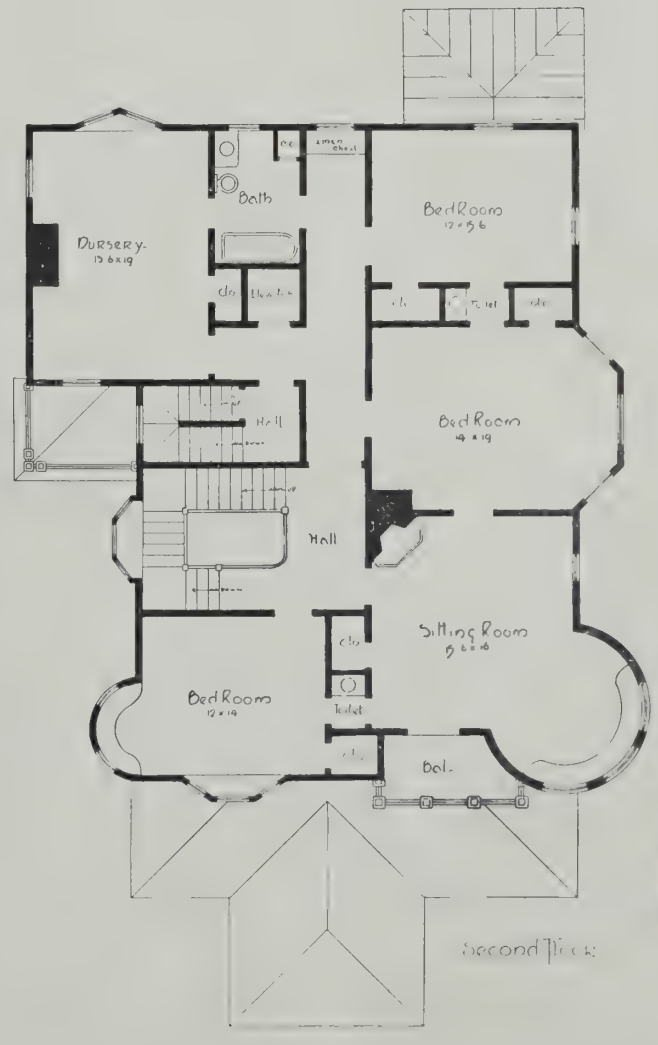
A COLONIAL RESIDENCE AT WEST NEW BRIGHTON, STATEN ISLAND, N. Y.—See page 97.

MR. JAMES WHITFORD, ARCHITECT.

A MODERN DWELLING AT SPRINGFIELD, MASS.—See page 96.

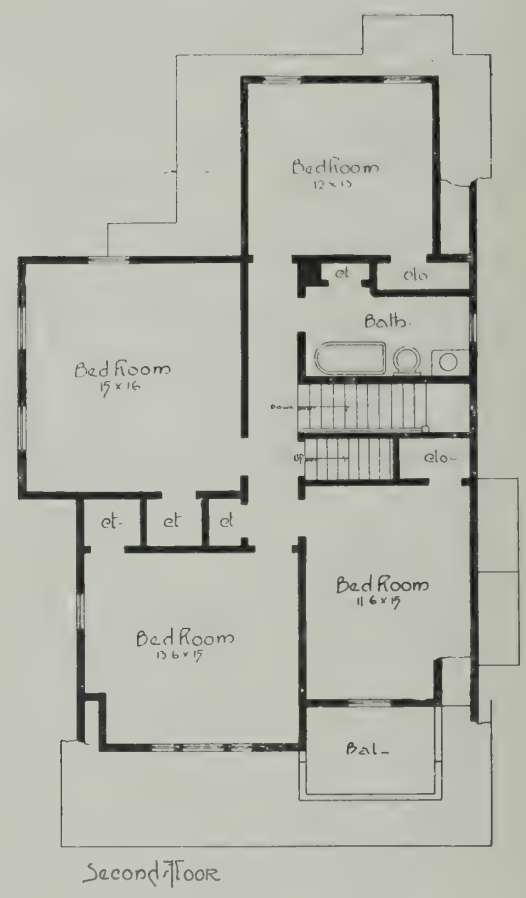
MESSRS L. F. NEWMAN AND C. H. PRATT, ARCHITECTS.

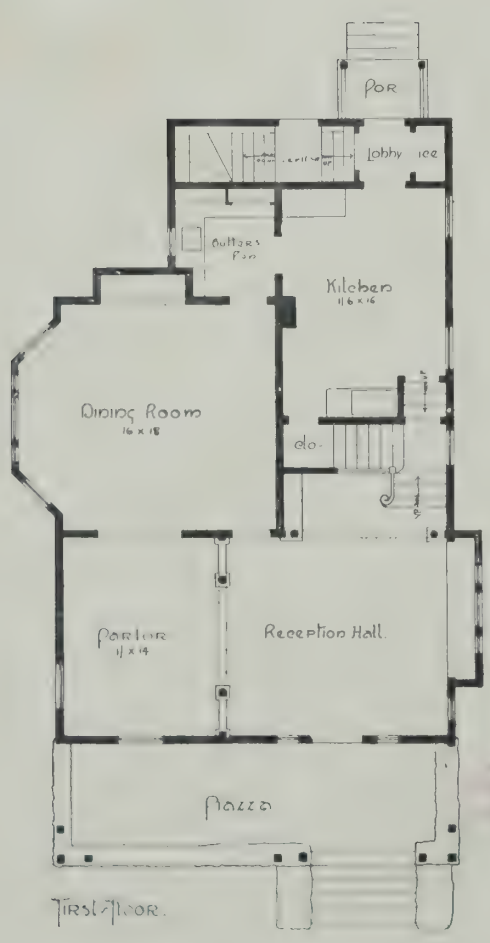




A RESIDENCE AT BRIDGEPORT, CONN.—See page 97.

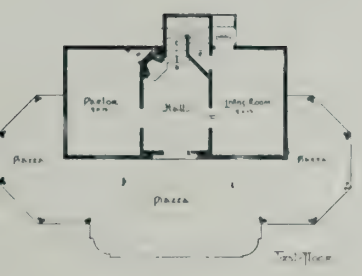
MR. WALTER P. BANKS, ARCHITECT.

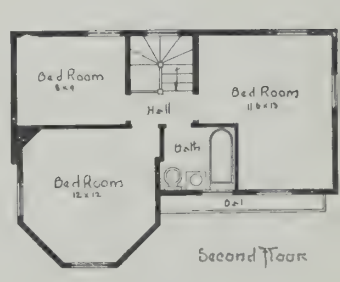




A MODERN DWELLING AT HARTFORD, CONN.—See page 98.

MR. F. R. COMSTOCK, ARCHITECT.





A GROUP OF DEAL COUNTRY CLUB COTTAGES AT DEAL BEACH, N. J.—See page 96.

MR. WILLIAM GARDNER MASSARENE, ARCHITECT.

A MODERN HOUSE OF LEARNING AT SPRINGFIELD, MASS.

We present on pages 86 and 87, in this issue, illustrations showing the new High School House, in the city of Springfield, Mass. This school building is, without question, the most conspicuous edifice in western Massachusetts, and is particularly attractive in its quiet and picturesque surroundings. In the design of the exterior a decorative quality has been obtained by expressing the lines of the interior in the most straightforward manner. While its proportions and details are based on the Italian Renaissance, the structure has an individuality entirely its own. The exterior decoration, chaste and dignified, is more especially concentrated upon the central portion of its north façade, which presents a masterly composition, with its wealth of refined and elegant detail. The triple-arched main entrance—crowned by a balcony and enriched with effective carving—is impressive in its strength and beauty of design. Flanking it on either side are huge granite buttresses surmounted by bronze, light-standard sentinels, as it were, to the openings, whose beveled plate-glass doors lead to a spacious vestibule, ornate and elegant, floored with marble mosaic and wainscoted with Italian marble. Here and in the assembly hall is chiefly concentrated the enrichment of the entire enterior. The foundation walls above grade are built of pink granite from the quarries at Conway, Me. The superstructure is constructed of "culled" buff brick, while the trimmings are of selected limestone from Bedford, Ind. Both the granite and limestone are finished in what is known as "six" cut work, a treatment that brings out the soft, rich color of both materials. The copper eaves and the unfading green of the roof slate present a unique combination. As a preventive against possible dampness, the exterior walks are lined with hollow brick and the interior surfaces covered with metal lath and hard plaster. The interior walls of brick are strengthened by steel framework from foundation to roof, which, with iron stairways and "slow burning" construction, provides a building practically fireproof. All exterior windows are glazed with polished plate glass, those facing the north and west bearing double sashes. Its main entrances are on the north façade, while two entrances are upon its east and four upon its west side, and these, with an open stairway 20 feet in width, leading from the corridor, upon which opens the assembly hall, afford ample opportunity for entrance and egress. Ample lighted corridors, 11 feet in width, traverse the building on every floor, leading to study rooms, recitation rooms, and other apartments, each of which is so located as to secure direct sunlight during the morning hours. Four iron stairways, having treads of asphalt, easy of ascent and with spacious landings, lead to the three floors above. The interior finish, except that of the assembly hall, loggia and main vestibule, is of carefully selected Western ash, the floors being rift heart Georgia pine, lined with two thicknesses of asbestos sheathing. The carefully designed architectural ironwork exposed to view, both on the exterior and interior, stairways, grilles, etc., is finished in verd antique, rich and quiet in effect. The hardware is of special design, of solid brass with dull satin finish. The building is wired throughout through iron armored conduit, for electric lighting, and also piped for gas, both equipments so arranged that only that section of the building in use need be supplied from the main switchboard or valve in the battery room, which is located in the basement. The gas and electric fixtures, manufactured from special designs, selected for excellence of artistic merit, are verd antique, and dull brass in finish, and command immediate attention for their graceful and unique design. The executive apartments are on either side of the main vestibule; on the left are the offices of the principal, where hangs the programme clock, a regulator, electrically connected with and synchronizing the forty-three clocks in the several apartments of the building. Here also is provided a fireproof vault for the safe storage of records and other papers of value. On the right of the vestibule is the visitors' waiting-room, directly connected with the office of the secretary, replete with book shelves and glazed closets; directly back of the desk is the telephone annunciator, which allows communication between any two apartments. Emergency rooms with all necessaries in case of illness are conveniently located. The assembly hall, for the use of the general public as well as for school purposes, is superb in its proportions, its architectural features, and its decoration and furnishings, and abundantly lighted through ceiling panels of opal leaded glass, and through windows opening to courts upon the east and west exposures. The startling color scheme of its brilliant red walls with woodwork of a grayish cream, blends in exquisite harmony with its simple, yet elaborate ceiling, a veritable dream in yellows. Its loggia and balcony, rich in architectural details, round an effect that grows in dignity. The seating capacity is 800. The chairs, 728 on the main floor and 72 in the balcony, all fixed to the floor, are both comfortable and pleasing in design. The loggia affords ample room for 200 additional chairs should occasion require. The exits are admirably arranged and admit of quick and rapid egress. The lavatories, with marble slabs and porcelain basins, are conveniently located between each study and recitation room, as well as in all apartments provided for the convenience of the faculty; lavatories are also provided for the general sanitaries located upon the several floors. The sanitaries are equipped with the most scientific of ventilated furnishings. These granolithic floors, marble partitions, dados, lavatory, and nickelplated metalwork suggest a cleanliness that cannot but afford satisfaction. Marble drink-water fountains are adjacent to stair-wells on every floor, while sinks of porcelain ware or soapstone are provided wherever required. On the second floor, directly over the main entrance and vestibule, is the library, its spacious shelving containing many books of reference, histories, and standard works, while ample tables and comfortable chairs create a desire to enter and enjoy its many privileges. On either side of the library, connected by sliding doors, are apartments for the teachers, each provided with special lockers for wraps, etc., lavatories, and appropriately furnished. The greater portion of the north front of the third floor is devoted to the mechanical and free hand drawing rooms; these apartments, separated by the instructors' office, are spacious, admirably lighted from over head, and furnished with conveniences specially designed for the work intended. Art in various forms, casts, models and photographic reproductions abounds, as in fact is the case throughout the building, the selection of subjects being remarkable in merit and interest. The other apartments on third floor are devoted to science, and are in appointments, both as to furniture, convenience and apparatus, most excellent. The lecture hall with tablet-armed chairs arranged in amphitheatre, fully equipped demonstration table, spacious hood, and apparatus storage space, is complete in every requisite. The conservatory, with asphalt floor, is filled with palms and other plants, and is adjacent to the stairway leading to the observatory tower with revolving dome and sliding shutter. The telescope, one of the finest instruments in New England, is the gift of the trustees of the Horace Smith estate. It rests upon a steel column directly connected with one of the foundation walls, thus preventing possibility of vibration. Dust chutes and book lifts extend from basement to attic at convenient points. The central feature of the basement, entered from the corridor with its asphalt pavement and tiled ceiling, is the lunch room or café. The basement also contains a bicycle room, and an aquarium lighted by an immense curved ceiling "Hyatt" disc, which throws a flood of light upon the furnishings below. In construction and arrangement the building represents the advantages and improvements now considered essential in school architecture, and is the result of careful study. In the plan every practical condition has been fairly met, and out of the many and diverse requirements, order, symmetry, and balance have been produced. The boiler house is of Ransome system of concrete construction, a combination of square twisted steel and concrete. The walls were constructed with travel-molds, cored out in order to insure their being dry and warm. The roof is constructed upon the same principle; bars of twisted steel spanning 37 feet in the clear are embedded in the bottom of the concrete rafters that give them the requisite strength. The boiler house in its equipment and arrangement is a model of convenience and cleanliness. Its granolithic floor, settings of enameled brick, nickelplated piping and trimmings, skeleton gauges mounted on black marble, impress on one the idea of a supervision seldom devoted to this important, yet usually neglected portion of our school buildings. Four horizontal tubular boilers, each 66 inches in diameter, and of 125 H. P. capacity, supply steam that is rapidly circulated through miles of piping by vacuum pressure. Conveyed in a 10 inch main through a commodious and well lighted conduit, the steam supply on reaching the school building is divided and conveyed to the several primary and auxiliary coils of radiation. Three primary heaters, each containing over 1000 square feet of radiation, have their intake from a light court or reservoir, that receives its supply of fresh air from above the ridges of surrounding roofs; the air drawn through these primaries by three 7 foot fans, and at a temperature of 70 degrees, is forced into a plenum chamber that traverses the entire length of the three sections of the building. This plenum chamber is provided with dampers, so arranged as to enable one or two fans to accomplish the work of three, in case of one fan being disabled. Ducts lead from this plenum chamber to separate shafts for each apartment, at the base of which auxiliary radiation can, at the will of the automatic heat regulators, increase the temperature of any apartment to any desired degree. The radiation for the assembly hall is arranged to work independently from the plenum chamber, if so desired. Direct radiation is provided for corridors and exposed places. The ventilation is accomplished by means of four exhaust fans, four feet in diameter, located near the top of the four vent shafts. These fans draw the vitiated air from each apartment separately. The sanitaries, chemical laboratory, and demonstration hoods have separate fans discharging into special ducts independent from the main shafts. Both motors and fans are of most recent and scientific construction, and are operated pneumatically from the office of the engineer. In fact, the entire heating and ventilating plant is a marvel of scientific convenience and efficiency. Messrs. Hartwell, Richardson & Driver, architects, No. 162 Devonshire Street, Boston, Mass.

A GROUP OF DEAL COUNTRY CLUB COTTAGES AT DEAL BEACH, NEW JERSEY.

We published in our last issue a group of cottages and a bungalow erected for the Deal Country Club, at Deal Beach, New Jersey, and we continue the illustrations by publishing on page 95 in this issue a second group of two designs showing a different style of architecture and plan, erected by The Atlantic Coast Land Company. We also presented in the same issue a general description of the houses, how they were constructed, how long it took to build them, etc., while we will confine the descriptions in this issue to the two particular houses published herewith. The first illustration presents a design treated in the Hindoo style of architecture, and in form is what is called "square-rigged," while its lines are sufficiently broken by the pagoda-like porches at either end of building and the unique little bay windows at second story over entrance-way, giving the whole a quaint and curious, but pleasing and artistic effect. The building being used only for summer use, there is no cellar provided beneath the building, consequently it is erected upon posts with stone footings. The superstructure is constructed of wood, and the exterior framework is covered with plaster boards and coated with plaster and cement combination, finished in a silver gray color. The woodwork is painted a chocolate brown as a body color, while the trimmings are painted cream white. The plans contain a central hall with fireplace built of brick, with hearth and facings of same, and finished with a neat wood mantel. There is also a staircase leading to second floor. Besides this central hall, there are a parlor and a living room which is used as a den and furnished in Turkish style. The second floor contains two bedrooms and bathroom. The trim throughout is mitred whitewood painted cream white. The doors and jambs are of cypress filled and varnished. The walls and ceilings are plastered and then papered with odd designs of wall paper in harmony with the style of the building. The bathroom is treated in ivory white, and it contains porcelain lined tub, marble fixtures and exposed nickelplated plumbing. The second illustration, on the same page, illustrates a design of a more modern style, while the interior is treated in a similar manner as the building already described. The superstructure above the grade line is sheathed on the exterior and then covered with shingles, stained a dull gray color, while the trimmings are painted white. The blinds are painted similar. The roof is also shingled and stained. The second story of bay window is constructed of logs placed upright, with their bark on them as they are hewn from the forest. The plan shows a broad open piazza, living hall, containing an open fireplace, a bedroom and stair hall with stairs leading to second floor. This second floor contains three bedrooms and bathroom. Mr. William Gardner Massarene, architect, Deal Beach, New Jersey.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT SPRINGFIELD, MASS.

The engraving shown on page 92 illustrates a modern dwelling which has been erected for the Forest Park Heights Land Company, at Springfield, Mass. The design is treated in a pleasing manner with piazza, bay windows, and gambrel roof. The underpinning is built of red brick, laid in red mortar. The building above, of wood, is covered with sheathing and paper. The first story is clapboarded and painted light yellow, with cream white trimmings. The second and third stories are shingled and stained a mahogany color, with similar trimmings. The roof is also shingled. Dimensions: Front, 32 ft. 8 in.; side, 45 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft. The reception hall is trimmed with ash, and it is provided with an open fireplace trimmed with tiled facings and hearth, and mantel, a paneled seat, and an ornamental staircase turned out of similar wood. The parlor is trimmed with whitewood treated in white enamel. The library and dining-room are trimmed with ash. The floors on this floor are laid with hard pine, finished natural. The pantry and kitchen are trimmed with whitewood, and are fitted up with the best modern fixtures complete. The second floor contains three bedrooms, den, dressing-room, five closets, linen closet, and bathroom. This floor is trimmed with whitewood, finished natural. The bathroom is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains two bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Messrs Louis Frank Newman and Carroll H. Pratt, architects, 21 Elm Street, Springfield, Mass.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A RESIDENCE AT BRIDGEPORT, CONN.

THE engravings and plans on page 93 in this issue illustrate a residence of modern treatment which has been erected for Charles H. Armstrong, Esq., at Bridgeport, Conn. The design illustrated shows a building treated in an artistic manner, good detail, and many excellent features, including bay windows, towers, balconies, and piazza, and porte-cochère. The underpinning and all stonework where shown are built of bluestone of a light grayish blue color. The exterior walls are sheathed, papered, and then covered with shingles, and stained a light shade of moss green, while the trimmings are painted white. The roof is shingled and stained in harmony with main building. Dimensions: Front, 45 ft.; side, 60 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The entrance is through a vestibule with paneled walls, and ceiling of oak and tiled floor. The reception hall is trimmed with quartered oak. It has a paneled wainscoting, ceiling beams, a nook with paneled seat, and a fireplace built of Tiffany brick, with hearth, facings, and mantels of same. The staircase is a grand one, with carved newel posts, and is lighted by a bay window thrown out at side and glazed with leaded glass. A toilet is conveniently located beneath stairs. The parlor is trimmed with cherry and is treated in white and gold, and it has a floor of birch, and an open fireplace with tiled facings and hearth, and mantel with mirror and columns. The sitting-room is trimmed with cherry and finished natural, and it contains an open fireplace, with tiled trimmings and mantel. The dining-room is trimmed with oak, and it has a paneled wainscoting and a conservatory opening out from dining-room. The floors are of birch and quartered oak. The kitchen and its apartments are trimmed and wainscoted with North Carolina pine, and they are furnished with all the best modern conveniences. The pantries are large and commodious and are fitted up complete. The sitting-room on second floor is trimmed with sycamore, and it contains a nook with seat and an open fireplace, with tiled trimmings. The other rooms on this floor are trimmed with cypress. The floors are of Georgia pine. The bathroom is trimmed and wainscoted with cypress, and it has a floor of Georgia pine. It is fitted up with Mott's fixtures, porcelain, and exposed nickelplated plumbing. The third floor contains four bedrooms and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Mr. Walter P. Banks, architect, Court Exchange Building, Bridgeport, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A COLONIAL RESIDENCE AT WEST NEW BRIGHTON, STATEN ISLAND, N. Y.

WE present herewith, on pages 90 and 91, in this issue, a modern residence of classic Colonial treatment, which has been recently erected for William S. Vanclief, Esq., at West New Brighton, Staten Island, N. Y. The design is treated in a most thorough manner, and the elevations show much study in detail, which is most excellently executed. The portico at front, with its massive fluted columns, with Corinthian capitals carved out of solid wood, is the feature which gives the principal character to the building, adding dignity and stateliness to the whole general effect. The underpinning is constructed of buff brick laid up in red mortar. The chimneys are built of same, with paneled tops as shown. The building is constructed in a substantial manner with North Carolina pine and spruce frame. The exterior is covered with sheathing, paper, and clapboarding, the whole painted Colonial yellow, with cream white trimmings. The roof is covered with shingles and left to finish natural. Dimensions: Front, 48 ft.; side, 56 ft., not including piazza. Heights of ceilings: Cellar, 8 ft.; first story, 11 ft.; second, 10 ft.; third, 9 ft. The interior is finished off in a very handsome manner with trimmings of special design. The main central hall is trimmed with quartered oak, and it has a paneled wainscoting. It contains an ornamental staircase, with rail and balusters running down and sweeping around to newel post, which is handsomely carved. The parlor is trimmed with whitewood, and is treated in old ivory white. It contains an open fireplace, with tiled facings and hearths, and mantel of special design. The library and billiard-room are trimmed with quartered oak, the former having an open fireplace built of cream-colored brick, with facings, hearth, and mantel of same, the whole finished with an ornamental cap. The living-room is trimmed with bird's-eye maple, while the dining-room is trimmed with quartered oak, the latter having a paneled wainscoting. The butler's pantry, kitchen and its apartments, and rear hall are furnished with all the best modern conveniences, complete in every respect. The second floor is trimmed with hardwood. The arch in hall is composed of a composition cornice and wood columns, and is very effective. This floor contains six bedrooms, large closets, sewing-room, and toilet and bathroom. The bathroom and toilet-room are all tiled with white tiling. The floors are paved with unglazed tile. The plumbing fixtures are all of onyx, with nickelplated trimmings. The elevator is a convenience, and runs with hydraulic power. The floors are of oak, and are filled and waxed. The house is heated with hot water and lighted by electricity and gas. It has a complete burglar alarm and electric bell system. The third floor contains one large children's playroom, four bedrooms, and servants' bathroom. A cemented cellar contains furnace-room, laundry, storeroom, and other necessary apartments. Cost, $18,000, complete. Mr. James Whitford, architect, Port Richmond, Staten Island, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN RESIDENCE AT BENSONHURST, LONG ISLAND.

THE engravings shown on page 88 in this issue illustrate a residence of modern treatment which has been erected for Mr. Oliver at Bensonhurst, Long Island. The design is attractive; it has many excellent features, including a spacious piazza with shingled columns. The underpinning is built of rock-faced stone laid up in a neat manner. The exterior framework is sheathed, covered with paper, and the first story is clapboarded and painted yellow with white trimmings. The second and third stories are covered with shingles and stained a dark reddish brown color. The roof is shingled also and stained. Dimensions: Front, 44 ft.; side, 40 ft., not including piazza. Height of ceilings: Cellar, 7 ft., first story, 10 ft.; second, 9 ft.; third, 8 ft. The entrance is through a vestibule, with a tiled floor and trimmings of ash. It has also leaded glass windows on either side of doorway. The entrance, reception and staircase halls are trimmed with ash, and they have paneled wainscotings and ceiling beams. The reception hall contains a paneled seat and an open fireplace, trimmed with tiled facings and hearth and a hardwood mantel. The staircase hall is separated from entrance hall by columns rising to ceiling, and it contains an ornamental staircase with newel posts, columns, balusters, etc. The parlor is treated with white enamel, and it contains an open fireplace trimmed with tiled facings and hearth, and a mantel, treated similar to woodwork, with carvings, etc. The dining-room is trimmed with oak, and it has a paneled wainscoting, a large circular bay window, nook for buffet, and an open fireplace. The kitchen and its apartments are trimmed with cypress, and each apartment is fitted up complete with the usual necessary fixtures. The second floor contains three bedrooms, large closets, and bathroom, all trimmed with cypress. The bathroom is wainscoted and furnished with porcelain fixtures and exposed nickelplated plumbing. The third floor contains several bedrooms and ample storage. A cemented cellar contains furnace and other necessary apartments. Cost $6,300, including steam heat and everything complete. Mr. John J. Petit, architect, 186 Remsen Street, Brooklyn, N. Y.

Our engravings were made direct from a photograph of the building, taken specially for the SCIENTIFIC AMERICAN.

SOME FORMAL GARDENS OF NEWPORT.

BY MISS MARGRET LA FARGE.

ONE of the most beautiful features of the palatial homes and modern villas of the Newport of to-day, is quite lost sight of by casual visitors, although its existence emphasizes tendencies in social life, and marks a new era in American rural architecture. This detail of unique, though sometimes hidden beauty, is the formal garden, many examples of which exist within the enclosed grounds of Newport's wealthy residents. It is true that, even in Revolutionary days, Newport was famous for its beautiful gardens. When the fleet of French transports, bearing Rochambeau and his troops, sailed into Newport harbor, beautiful "Peggy" Champlin received the gallant French commander in the Champlin garden, at that time in its glory. The house still stands, but the garden that once abounded in flowers, box hedges, and what the Spanish call "huertos," little pleasure orchards, has disappeared. In those days the principal life of Newport society was along old Thames Street, at that period the fashionable residence street. Although these quaint Colonial houses fronted directly on the street, in the rear of house after house stretched out toward the bay shore a series of lovely gardens and terraces, sloping down to the harbor's edge.

How this Old-World tradition of family privacy and domestic seclusion has disappeared with the destruction of high board and picket fences, over which lilac trees were wont to lean their heads, is a matter of common knowledge. Ruthless hands even destroyed the beautiful stone walls that were once so numerous in Newport, and which have been replaced by iron posts and cross bars, sometimes overrun by a honeysuckle creeper until old posts gave place to new ones, accompanied by a mutilation of the creepers.

To-day, however, all over Newport the poor as well as the rich are planting hedges, or building high wire fences on which to run the beautiful thick growing clematis paniculata. Within these enclosures the area and extent of cultivation depend upon the wealth or inclination of the proprietor. This cultivation reaches its highest perfection in the formal gardens of Newport.

One of the handsomest houses in Newport is that of Mr. J. J. Van Alen. The high wall which encloses it is a good instance of what can be done with a stone wall that serves to protect the owner's grounds from vulgar curiosity and intrusion, yet remains in itself a beautiful feature of the place. The house is an excellent example of Elizabethan architecture. At first sight, the grounds might appear too small, in comparison with the size and grandeur of the mansion itself, but their extent seems enhanced by this stone wall, over which a creeper grows profusely. Branches of trees, that line the inner edge of all four sides, overhang the wall, and afford a delightful shade to the pathway outside. The house is not shut out from view. Very handsome wrought iron gates adorn the front entrance; they are always open, and give to passers-by a lovely vista of green and well-kept lawns. In perfect harmony with the architecture of this place is the Elizabethan garden on the north side of the estate. Terraces lead down from the house, and the descent into the garden is made by a flight of low stone steps. A well designed high green treillage forms the back. In the center of this is built a rounded bench, over which the same lattice makes an arch. The flower beds are laid out in formal manner, with borders of box and graveled paths, running around and between them. We present several illustrations on page 89.

Another place in Newport where this same trelliswork has been used with such happy effect, is that belonging to Mr. Egerton Winthrop. Here it is combined with an Italian "Pergola," and, although smaller than Mr. Van Alen's, is certainly quite perfect in its way. Here, again, we see the same treillage, rounded niche and seat, over which the creepers have grown profusely. In front of this stands a statue, the foliage and soft green color of the trellis forming an exquisite background to it. A peristyle of green posts, with the same creeper (clematis paniculata), runs along one side of this little garden. Standing in the drawing-room and looking out through the long French window, from which steps lead down into this lovely pleasure spot, it is hard to realize that one has not stepped back into some old French arbor, such as we see in Watteau's well-known scenes. The pergola is continued on the other side of the house. Here it is longer and borders a little formal garden on one side. All parts of this place show what lovely effects can be obtained even in a limited space.

On the grounds owned by Mr. Edward Wharton, this trelliswork has again been used with wonderful success. Here it was built essentially as a protection for the flower garden against the terrific gales that blow, almost unceasingly, at that end of Newport. It was necessary to construct it in a manner fitted to stand the wild and stormy winds of the Atlantic, which it overlooks. The wooden columns are about ten feet high, quite massive, and are painted white. The trellis is, of course, green, and the slats are laid in a horizontal position, more in keeping with the line of the architrave which runs along the top of the columns. The gate of entrance presents a fine architectural effect. It is a continuation of the lattice. The garden, which is quite a large one, is laid out in formal design. Four paths radiate from a limestone obelisk in the centre, over which an imported ivy is gradually making its way. The flower beds are almost entirely filled with old-fashioned flowers, many herbacesus among them. Quite a number of the plants have been grown from seeds imported from England, but little known to American gardeners.

The erection of several houses in Newport according to designs in the French and English country house style has created a demand for terraces. The turf of this place is well adapted to this treatment of private grounds, as it remains very green and velvety during the summer season. Large Newport estates, bordering on the cliffs, labor under a disadvantage imposed by law, which gives to the public a right of way along the whole length of territory skirting the cliffs. Some wealthy owners of places bordering on the cliffs have sought greater privacy by raising their lawn just above the heads of persons following the footpath marking the ocean boundary of these estates. Some of these fine properties are surrounded with heavily constructed balustrades, opening here and there with low stone steps leading to the lawn below.

In the terrace adjoining the house of Mr. Cornelius Vanderbilt a little formal garden has been sunk a few feet below the surface of the land. The result is a delightful one, as the garden is not seen until standing on the terrace. When the somewhat new aspect has passed away, in the lapse of time, the views of the sea across the green lawn, as seen through the stone balustrade, seem likely to rival anything of the kind in the world.

Another charmingly laid out terrace garden is that of Mr. David King. The house is a splendid example of Colonial architecture, and in very good proportion to the grounds. The high terrace, which runs around the house on three sides, is enclosed by a white railing of lovely design, over which railing creepers are trained to grow. Flower beds follow the line of the house with a

narrow box-edged, graveled path running between them. In these beds are only old-fashioned flowers.

The beautiful little summer garden belonging to Mr. William Storrs Wells was the first of its kind in Newport. Nothing could be more perfect than the way every detail has been carried out. It is in full view of every one passing along Bellevue Avenue. Low flights of steps, thickly growing ivy, and the graceful urn that adorns the centre, all constitute a delightful picture on which to rest the eye.

These are but a few of Newport's beautiful gardens. Each year adds new ones to the list.

A MODEL COTTAGE AT NUTLEY, NEW JERSEY.

We present as the subject for colors and also on page 84 in this issue, a model cottage which has been recently completed for William A. Lambert, Esq., at Prospect Heights, Nutley, New Jersey. The design is most admirably executed, and it is a difficult matter to secure both attractive elevations and well arranged plans at a low cost, but in the erection of this building the whole three have been obtained. The underpinning is built of rock-faced field stone laid up at random. The exterior framework above is covered with sheathing paper, and shingles stained a mahogany color. The clapboards at first story and under piazza are painted a reddish yellow. The trimmings throughout are painted cream white. The roof is shingled and stained a dull shade of old moss green. Dimensions: Front, 28 ft.; side, 30 ft. not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 8 ft. 8 in.; second, 8 ft. 4 in. The interior is trimmed throughout with yellow pine, finished natural. The hall contains an ornamental staircase turned out of ash. It also contains an open fireplace built of red brick, with hearth and facings of same and a Colonial mantel. The parlor has a bay window and is separated from dining room by an arch-way. The kitchen is fitted up complete with a Thatcher range, sink, stone tubs, and pantry complete. Floors of hard pine and oiled. The third floor contains three bedrooms, ample closets and bathroom, the latter being wainscoted and furnished with a steel clad bathtub, etc., with exposed plumbing. The cemented cellar contains a Thatcher furnace and other necessary apartments. The attic, reached by a scuttle, contains ample storage. Cost $2,000 to $2,300, according to locality. Mr. W. A. Lambert, architect, 99 Nassau Street, New York City, N. Y.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

A MODERN DWELLING AT HARTFORD, CONN.

We present herewith on page 94 in this issue illustrations showing a modern dwelling which has been erected for M. A. Norton, Esq., at Hartford, Conn. The design is attractive—has many excellent features, and is a combination of good elevations and wall arranged plans. The underpinning and balustrades to piazza are built of field stone laid up at random. The remainder of the building is covered with sheathing, and then shingles stained a dark yellow green color, while the trimmings are painted white. The gable ends are beamed forming panels, which are covered with stucco-work. The roof is covered with shingles and stained a dull green. Dimensions: Front, 32 ft.; side, 44 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft.; second, 8 ft. 6 in.; third, 8 ft. The interior is trimmed with white pine, and is painted throughout with china white. The doors are stained mahogany, and polished to a fine finish. The reception hall is treated in a unique manner with bay window and paneled seat. The staircase is an ornamental one, and is separated from hall proper by an arch way with columns. The parlor is separated from reception hall by a similar archway. The dining room, large and spacious, has a buffet built in. The kitchen and pantries are wainscoted and are furnished with the best modern fixtures complete. The second floor contains four bedrooms and bathroom; the latter is wainscoted and furnished with porcelain fixtures and exposed plumbing, all nickelplated. The third floor contains the servant quarters and ample storage. A cemented cellar contains a furnace, laundry and other necessary apartments. Mr. F. R. Comstock, architect, 124 West Forty-fifth Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the Scientific American.

The Bridge as a Religious Edifice.

An interesting collection of extracts from old public documents which bear much evidence to support the belief that at one time a bridge was considered a religious edifice in Great Britain, was printed in a recent issue of "The Architect." They relate principally to the town of Barnstaple, England, where it appears that one of the most important bridges could not be repaired unless by following the practice of the mediæval monks and begging from door to door.

Among the archives of this town there is a grant, dated 1305, from the widow of William le Sneeler, for her soul and the souls of all her benefactors, of a yearly rent of three-pence to the Longe Bridge of Barnstaple (Longo Ponti Barnastapol) for ever, out of a tenement lying between the grantor's tenement and the tenement of Bernard de la Boghe. A similar grant is dated 1331 from Beatrice, the daughter of Richard of Piwerchi and widow of Richard le Sometere of Toriton, to God and for the maintenance of the Long Bridge of Barnestapol. By a third grant, Agnes atte Ferys gave, in 1386, six shillings yearly to the bridge, and in 1395 Idonia Stayr endowed the bridge with her interest in the tenement in order that the rent should be applied to the upholding of the structure.

In 1422 John Taylor, of Lecheton, having made several legacies for altars and lights in the churches, bequeathed all his tenement in Lecheton with the houses built upon it, and its gardens and all appurtenances, to the conservators of the Long Bridge of Barnstaple for ever, on condition that they would have religious service performed for his soul's peace. What is most remarkable is that in the thirty-seventh year of the reign of Henry VIII., or about a year before the king's death, the Mayor and other authorities of the town kept up the practice of performing those services, although they were contrary to law. They granted a safe-conduct and protection, for four years, for John Gorway, his assigns and deputies, appointed during the said term to solicit and collect gifts in Dorsetshire for the repair and maintenance of the Long Bridge of the town over the "great hugy-mighty perylous and dreadful water named Taw joinynge and being betweene the townye of Barstaple aforesaied and the parisshe of Tawstok." To win gifts from the perusers of their letters testimonial the writers say: "We the aforenamed John Holland, Mayor of the said towne of Barstaple, Philippe Conier and other above named do desyer and hertely pray you in and for the honor and love of God and of your cherite to departe with some portions of your goods after your powers towardes the reparacion mayntenaunce and edifieinge of the saied bridge and cawsies for the whiche we doute not but that you shall haue gret mede of Almighty God for your so doinge and of vs hartie thankes. And also ons in the yere we haue a general dirige and masse solemply songe with all the prestes and clarks in the church for all the bretherne sisterne and well doers to the saied bridge and cawsies."

In 1556 the Bishop of Exeter, the Earl of Bath, several knights, the Dean of Exeter, and various ecclesiastical officials, at the petition of the Mayor and burgesses of Barstabell granted licenses to John Harte and his deputy authorizing them "to desire aske collecte receve and gether the charytable almes and goddly rewards gyftes and benevolence of good Cristan and well disposed people within the Countes of Deuon and Cornwall aforesaid toward the vse reparacyon and mayntenance of the same Longe Bryge of Barstabell and cawsy aforesaid," and requiring and charging "all and syngular parsons vykars curates and ecclesyastycall persons with other the kynges and quenes majestes officers minysters and subjectes within the said countes of Deuon and Cornewall to assist in their parishes and elsewhere" the bearers of the letters, and to be zealous in furthering the purpose of the testimonial.

A portion of the letter is as follows: "For asmoche as it is right merytoryous and beneficyall to testefie and declare the truth of all such thynges as the knowledge thereof may further helpe the Common Welth of any Realme or Country, and ignorance thereof may happe to hynder and impayre the same, for avoydyng whereof and because of Right Congruence and good reason it apperteyneth and besemeth all true English hartes accordyng to oure talent abylitie and poure to helpe maynteyne vpholde and further all auncyent and lawdabell Furnyture as burgges causes and other necessary thynges provyded ordeyned and made by oure progenitours, and in tyme paste in suche places within this realme where vrgent nede and oportunyte hath ben to the universall comonwelth and comodite of the people of this Realme of England. We therefore the said Reuerend Father in god the other aboue named with all expedycyon menyng the . . . thereof, and not mistrustyng but all dyscreet and well disposed people will putt theire helpynge handes towardes the same do by thies our present letters testymonyall certifye publyshe and declare vnto you of a very truthe that there is a great huge and longe brygge at Barstabell in the county of Deuon made of lyme and stone of syxtyn arches and pyllors and not onely the greate freashe water ryver called Taw contynually runneth but also the salte water at every tyde that is to saye too tymes in eury xxiiii houres doth ebbe and flowe vnder and throwght the said bryge, and also there is a large longe causy therevnto lying sett large in bredth with longe stones postes and rayles of tymber, to showe and signyfie the same causye, and therevpon to conduct directly all suche persons as shall happen ther to travel at any tyme when the salte water floweth ouer the said causy," etc.

An award connected with the bridge which was given in 1461 reveals a custom which, it is stated, was mainly confined to the West of England. There was a dispute between Richard Davy, of Ilfracombe and the Mayor and commonalty of Barnstaple, relating to property in the High Street of Barnstaple. The arbitrators decided on the disposition of the property, of which the remainder, under certain conditions, was to go to the "wardynez of the longe brugge of the towne forsaid, to thair heirz and successours for euer, to the behove profite and mayntenaunce of the said brugge." The deed was duly signed and sealed. Six of the seals are still attached to the document, two of them being especially worthy of notice for their evidence that the sealing was done through such rush rings as were commonly used by the peasantry in plight of matrimonial troth. The perfect rush ring of one of these seals still adheres to the wax, though it is fully exposed by the breaking away of the wax that once covered it. On the circular margin of the other seal, which has been broken in like manner, the impression of the rush ring is as distinct as the impression of the seal.—The Engineering Record.

Preparation of Oil Copal Varnish.

This is prepared by melting coarsely crushed copal, 240 grammes; purified oil of turpentine, 260 grammes; readily drying linseed oil varnish, 360 grammes. The copal is placed in a glazed earthen pot of sufficient size and well moistened with oil of turpentine. The pot is then closed with a lid, placed on glowing coal, and left there about a quarter of an hour, until the copal is melted. When melting commences, stir with an irod rod until the copal has dissolved completely. Now add boiling hot linseed oil varnish, slowly and with constant stirring, the coal fire being increased, so as to cause the mixture to bubble up a few more times, whereupon the pot is removed from the fire to cool off, and the warmed oil of turpentine kept in readiness is added.

The varnish produced in this manner is sifted through oakum, into a dry, previously warmed vessel. Before applying the varnish, the wooden articles are coated with weak glue water (size) or with linseed oil varnish, and when the ground has dried perfectly the varnish is put on uniformly with a good brush. As a rule, one coat of this varnish suffices, but if a second one becomes necessary, it should only be applied when the first one is completely dry. Later on the dry varnish is smoothed and rubbed down. The fusing of the copal may also be carried out in a glass flask surrounded with wire work. Hang the flask over a gas flame, and keep it in constant motion until the copal has melted.—V. H. Soxhlet, in Neueste Erfindungen und Erfahrungen.

The Elgin Marbles.—Attempts having been made fom time to time, and even up to now, to discredit the action of Lord Elgin, the British Ambassador to the Porte in 1799, in removing the sculptures of the Parthenon at Athens to the British Museum, it is of interest to note that an official pronouncement is forthcoming from Bloomsbury which points out that the Parthenon marbles were suffering daily injury, and that there was no prospect of better care being taken of them. In the fifty years immediately before Lord Elgin four figures had entirely disappeared from the west pediment, and others had been much injured. The frieze was suffering in the same manner, and the Athenians of that day thought that they heard the sculptures that were removed groaning for the fate of those that were left behind. A further justification of his action is supplied by the additional deterioration which the sculptures that were left in position have suffered since Lord Elgin's time. Whether this pronouncement on the part of the British Museum authorities will satisfy the advocates of restoration remains to be seen. It may lead to a revival of the controversy, but to the general public the official statement seems likely to carry conviction once and for all.—Birmingham Post.

The Ashmolean Museum.—The Ashmolean Museum, which has largely benefited by Dr. Fortnum's liberality, cannot be considered as altogether satisfactory in its foundation. Elias Ashmole contrived to obtain the reputation which attaches to the creation of such an institution, under false pretenses. The collections belonged to the Tradescants, who had gathered them during a long period. They intended to present their treasures to the University, and Ashmole was consulted on the subject, as he was supposed to be a scholar with more than human wisdom. Ashmole, like Iago, thought he would profane his knowledge in dealing with such simpletons, unless for his sport and profit. He obtained credit from the University authorities for his munificence, and succeeding generations have accepted the error.—The Architect.

A Built-up Board.

The New York Lumberman's Review says the built-up board "is now being looked upon with favor by a group of capitalists who see in it a most durable and generally superior box board. It has been found that beech, birch or maple cut into thin veneers and cemented together, three ply, the whole being about five-sixteenths of an inch, makes a very superior packing case for all kinds of heavy or light merchandise. The chief advantages claimed for the built-up board are strength and lightness. If the package proves acceptable to the general user there will be practically no limit to its field."

PLANT AND PROCESS FOR FIREPROOFING WOOD.

DURING the past year there were two tragic events, resulting from sudden and unexpected conflagrations, which made a profound impression, not merely on the countries concerned, but throughout the world at large. One of these was the swift destruction by fire, due to the shells of the American warships, of the Spanish cruisers engaged in the battle of Santiago, and the other was the awful conflagration by which the Windsor Hotel, in this city, was wiped out of existence with an attendant loss of nigh upon half a hundred lives. Although neither event taught the world anything that it did not know before, they both impressed deeply the lesson of the perils which are involved in the extensive use of wood as a material of construction where the risk of fire is aggravated and ever present. It has been commonly supposed that the Spanish ships contained a larger amount of woodwork than is usually found in warships constructed at the same date as themselves. As a matter of fact, however, they carried in the shape of decks, bulkheads, and partitions, no more woodwork, and indeed not so much, as is usually found in cruisers that were built about the year 1890. So far from the conditions being favorable for such a rapid conflagration as took place, they were actually unfavorable. The decks were largely protected on their under side by the deck beams, stringer plates, and diagonal strapping, so that not only was the amount of under surface exposed to fire greatly reduced, but the large amount of ironwork in close contact with the overlying decks would, by conducting the heat rapidly away, tend to retard combustion. Yet it is a fact that these vessels had not been many minutes under fire before our shells had set them so fiercely ablaze that before the Spanish batteries had been disabled, it was necessary to run the vessels ashore in the effort to save the lives of the crews.

Naval men had been well aware, previous to the battle of Santiago, of the extreme peril involved in the presence of inflammable wood in the construction of warships, for at the battle of Yalu the Chinese gunners spent more time in putting out fires than in serving their batteries. The lesson suggested at Yalu received such a power of

BLOWPIPE TEST.

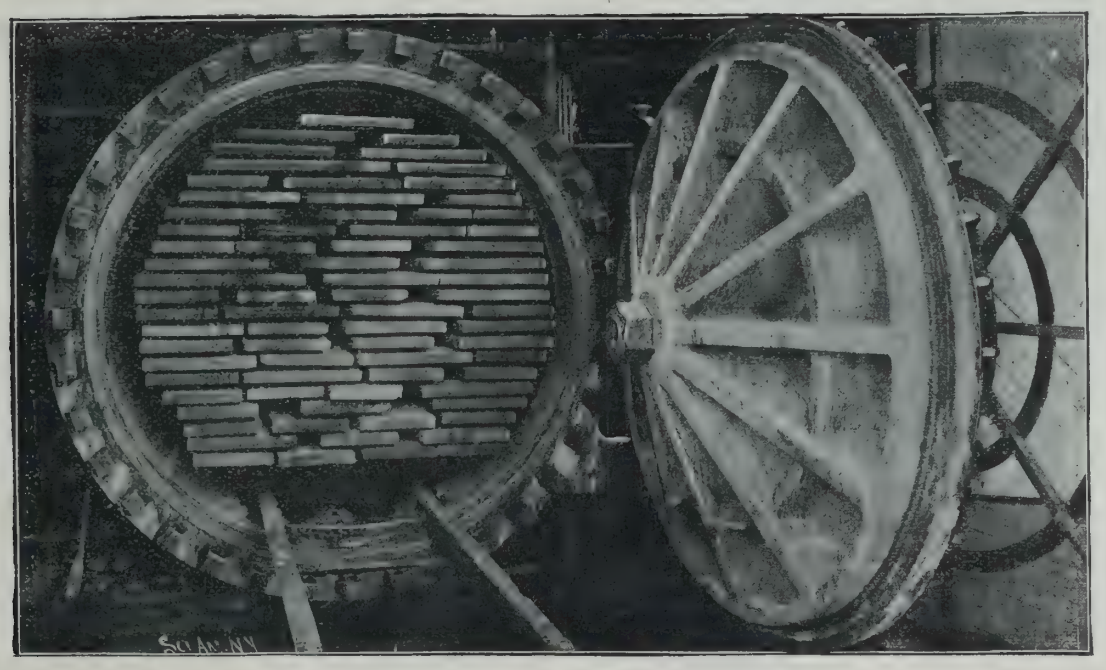
indorsement at Santiago and Manila that it is safe to say that every ship designed since the date of the Spanish war will be provided with as little woodwork as possible, and what it carries will be rendered non-flammable by some system of fireproofing.

Of the many terrible conflagrations on land, we have quoted that which occurred last spring at the Windsor Hotel, because there is no question that the fearful rapidity with which the building was burned down was due to the large amount of wood which entered into its construction. It might also be mentioned that the destruction of the upper stories of the Home Life building, last winter, would scarcely have occurred, or at least would not have been nearly so complete, if the floors and general trimmings had consisted of non-flammable instead of untreated wood. It seems almost superfluous to emphasize the value of using for constructive purposes in any structure that is at all exposed to fire risk materials that are non-flammable and which in the presence of conflagration will add nothing to the fierceness of the heat.

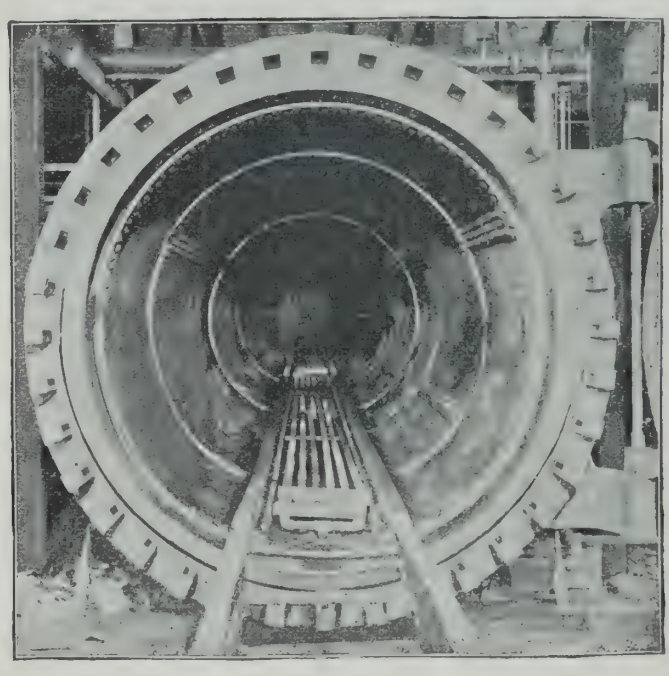
The accompanying illustrations serve to give a clear conception of the methods adopted by a first-class fireproofing plant in the treating of wood. They represent the plant of the American Wood Fireproofing Company, of Newark, N. J.

As this is one of the latest to be put up, it may be taken as thoroughly representative of the present state of the art.

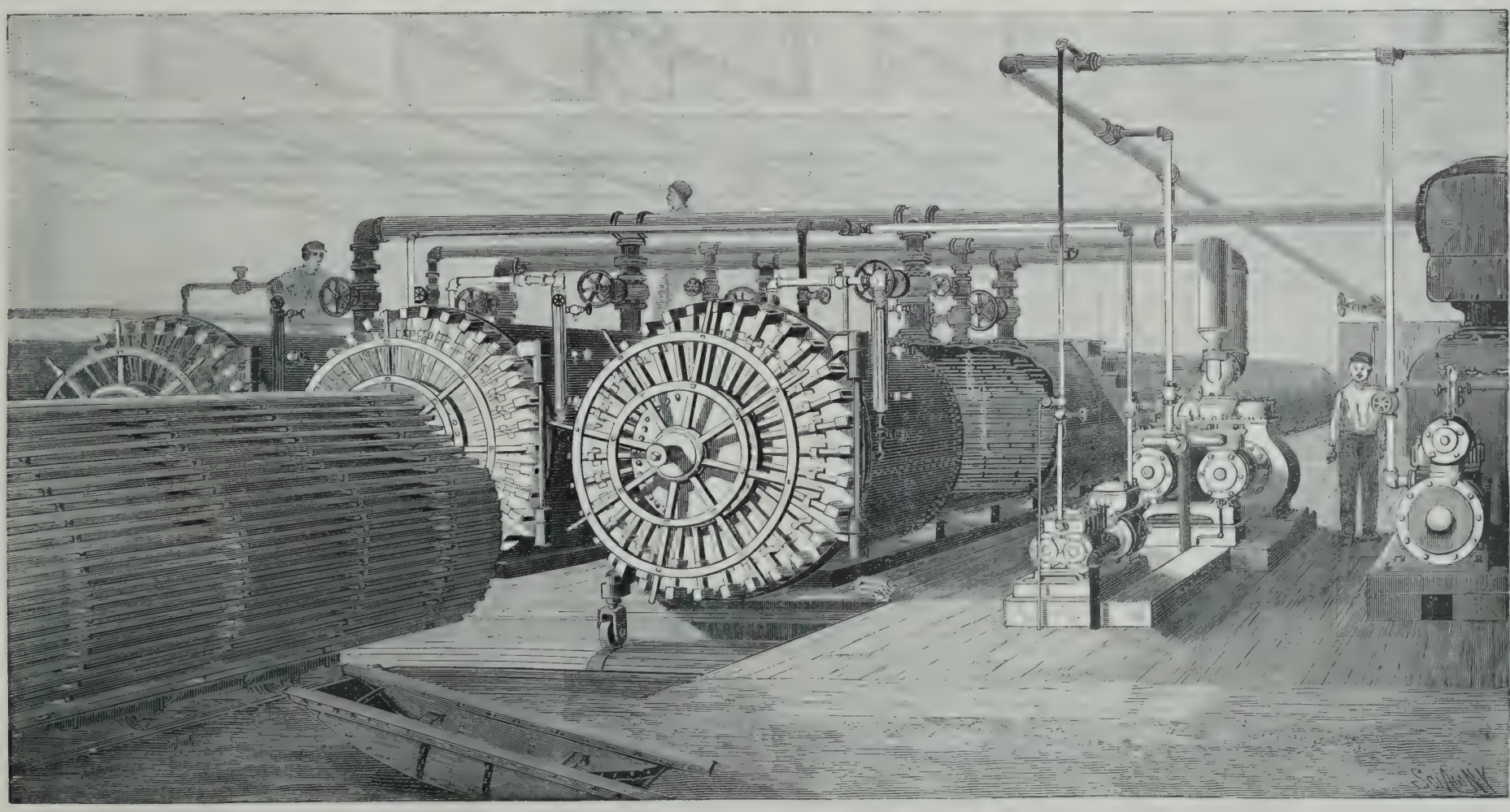
The plant consists essentially of three large digesters, which are built up of three-quarter inch flanged steel, and guaranteed to a pressure of 400 pounds to the square inch. Two of these are 6 feet 8 inches in internal diameter and 106 feet in length, and the third is of the same diameter and 32 feet in length. One end is permanently closed by a hemispherical head; the other end is provided with a massive cast steel hinged covers 6 tons in weight, which is hung on a vertical hinge and may be swung to one side, as shown in our engravings, during the charging and emptying of the digester. It is provided with 36 heavy radial bolts, which engage



DIGESTER OPEN, SHOWING METHOD OF STACKING WOOD.



INTERIOR OF DIGESTER, SHOWING TRACKS, ETC.



PLANT OF THE AMERICAN WOOD FIREPROOFING COMPANY.

the same number of sockets formed on the face of a cast steel flange on the digester. The locking bolts are of a rectangular cross-section and are cam-shaped at their outer ends, while at the center they abut against the inner side of a large plate washer. This washer is carried upon a massive screwbolt, which projects from the center of the cover, and is driven home against the cover by means of a massive threaded nut and hand-wheel, as shown in the general illustration of the plant. As the nut is screwed home, it presses the plate washer down upon the inner ends of the radial bolts, driving them into their several sockets and causing them to act with a cam-like effect to press the hinged cover to a snug bearing upon the face of the digester. A track formed of lengths of Z-iron runs the full length of the digester. A short piece of movable track is provided, by means of which these rails may be connected with the system of tracks which extends throughout the yard.

The wood which is to be treated is loaded upon small trucks until it conforms approximately to the curve and diameter of the cylinders, care being taken to observe a somewhat uniform spacing in order to allow a free circulation for the chemical solution with which the wood is to be treated. The timber is then secured to the tracks by iron bands and the trucks are wheeled into the cylinders and clamped down securely to the track. The end doors are then packed with a rubber gasket, swung to, and securely clamped. Steam is now admitted at a low pressure of about 10 pounds to the square inch, and the whole charge is submitted to a steam bath, which penetrates the wood, softening and loosening the dried juices which have remained in its fiber. The length of time during which the charge is subjected to the steam bath depends both upon the variety of the wood and its thickness, and it may be anywhere from one to fifty hours. After the steaming process is complete, a powerful vacuum pump is applied for a period of from three to fifteen hours, the vacuum as recorded by the gauge being from 27½ to 28 inches. The immediate effect of the vacuum is to draw out of the cellular structure of the wood all of the saps, juices, etc., and leave it in a condition which might be described as that of an extremely finely divided honeycomb. When the vacuum treatment is complete, an alkaline solution is allowed to flow into the cylinders, great care being taken to prevent the entrance of any air. As the solution rises in the cylinders it is absorbed by the cavities of the wood until the latter is nearly saturated. To assist the absorption, the pressure pump is started and the pressure is raised to 200 pounds to the square inch, the pumping being maintained as long as there are any indications that the wood is absorbing the solution. The surplus is then pumped back from the cylinders to the storage tank, the doors are opened, and the wood is run out again to be stacked in the air for drying, or if so desired it is run directly into a drying kiln. In drying, the water evaporates and leaves all the inner walls of the cells covered with minute crystals of fireproofing salts.

This completes the process, and the treated wood is to all appearances the same as before it went through the operation. It contains all of its original properties except that by withdrawing all that remained of the juices the wood has been relieved of that portion of it that would tend to set up fermentation. Hence, incidentally, the treatment is a preservative one, for it substitutes an antiseptic in place of material which is the direct cause of dry rot. The treatment also has the advantage that the wood is so thoroughly filled that when it comes to be painted very much less oil is required than would be necessary in the case of untreated wood. Moreover, the fireproofed material is susceptible of a much higher polish even in the case of such soft woods as white pine and poplar.

Extensive tests of the treated timber have shown that the strength of the wood is slightly increased in some varieties, and slightly decreased in others, the average decrease of strength in all the varieties of timber that have been treated and tested being not over 5 per cent. Such a heavy impregnation with salts necessarily adds to the weight of timber, the increase being from 5 to 15 per cent. according to the variety that is under treatment.

One of our illustrations shows a little experiment which strongly illustrates the non-flammable quality of the wood. Not only is it impossible to ignite a shaving, but a strip of wood may be subjected to the heat of a blowpipe without any appearance of a flame, and nothing more than a temporary glow, which passes off immediately upon the removal of the blowpipe. This experiment proves that although the treated wood may be charred to a certain depth, beyond which the heat fails to penetrate, it is impossible for it to burst into flame and add to the heat of a conflagration.

The process as carried out at these works and above described has been approved by the recent United States Naval Board, as being equal to any submitted to that board for test. The company has recently received a contract from the government to supply the interior wood construction for a building which is now being erected at the Brooklyn navy yard for use by the Ordnance Department of the United States navy for the storage of high explosives. The process has also been accepted by the Civil Engineering Bureau for use in the new executive building at the same navy yard, and the General Electric Company have now under treatment lumber to rebuild where fire recently damaged one of their buildings.

THE OPEN FIRE.

With its healthful ventilation, its warmth and comfort—the bright, blazing fire in a grate on a cold day is like sunshine after days of cloudy weather. These pleasures can never be had from the stove, steam or hot air radiator. Hence, the fireplace should be among the first things to be considered when building or remodeling a house.

The principal complaint heretofore of the grate has been its smoking and escaping gases into the room; the inability to regulate the fire; cold drafts when fire became low; the ashes falling on the hearth; and the great loss of heat which passed up the chimney—about 80 per cent. passed up the chimney, leaving but 20 per cent. for the room. No wonder then that grates have been considered a luxury for only the rich to enjoy.

These faults of the grate have been entirely remedied by the fireplace heater made by J. H. Heitland, Quincy, Ill.

Our illustration shows the line of draft (indicated by arrows on the bands) and warming chamber door open.

All the smoke must come to the one outlet at the front,

FIREPLACE HEATER.

directly back of the regulator, or check. This opening is adjusted to the size needed by means of a damper rod.

The smoke and hot air, after having passed through the opening, back of regulator, will then pass under the hot air chamber, thus heating the air therein. The air will at once start up a circulation around the portable shelf.

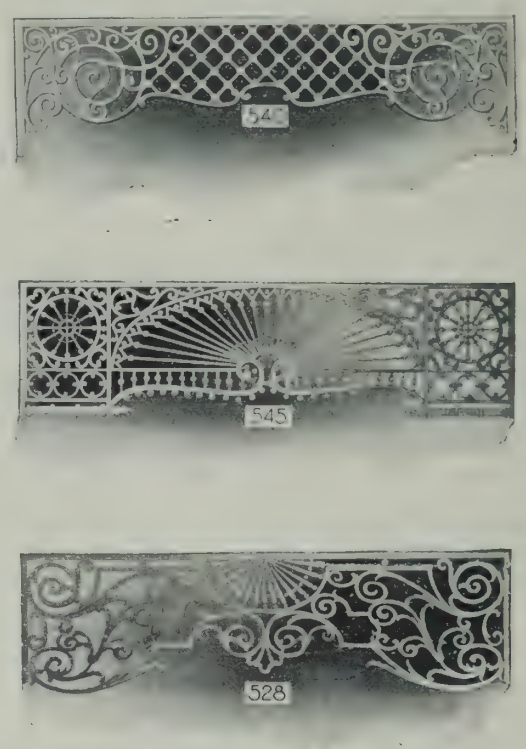
The chimney throat back of heating chamber is increased or decreased to the same extent as the opening back of regulator, and by the same motion. The opening for the smoke need not be larger than the space in a 5-inch stove pipe, except when starting or replenishing the fire with fresh coal. All the heat is saved and in consequence a great economy of fuel is effected, thus heating more than double the space with same fuel.

A dish with water placed in the heating chamber will furnish moisture to the room. If the slide in door to chamber is closed to retain the heat, the temperature will be from 150° to 250°, according to fire. The regulator is made to swing, and is held at any point to suit the temperature of room or to keep the fire over night. The chimney throat is double the distance from the fire of any other grate, hence no escaping of unburnt gases up the flue. The combustion is so perfect that no clinkers will be found in the ashes. The regulator enables one to control the fire, so no fender is ever necessary. The heaters are made in various sizes, to suit any mantel.

Cement for tin is produced by dissolving equal parts of shellac and colophony in 6 parts of strong spirits of wine.

FOSTER-MUNGER WOODWORK.

The Foster-Munger Company of Chicago, Ill., have issued a most complete catalogue of stock-work, of doors, blinds, sash, grilles, mantels, wood-carpet, stairs, veneered doors, leaded art glass, porch-work, sliding and Venetian blinds, and all other special interior work. The company is particularly active in the grille and fret work which is now coming so generally into use. Our illustrations show how elaborately these grilles are made. The company make these grilles in any of the various hardwoods. In wood-carpet, hardwood mantels and stair-work, the designs have been prepared with equal care. How extensive is the company's business may be gleaned from the fact, that their factory has a capacity of 1,000 doors daily, with sash and blinds in proportion.



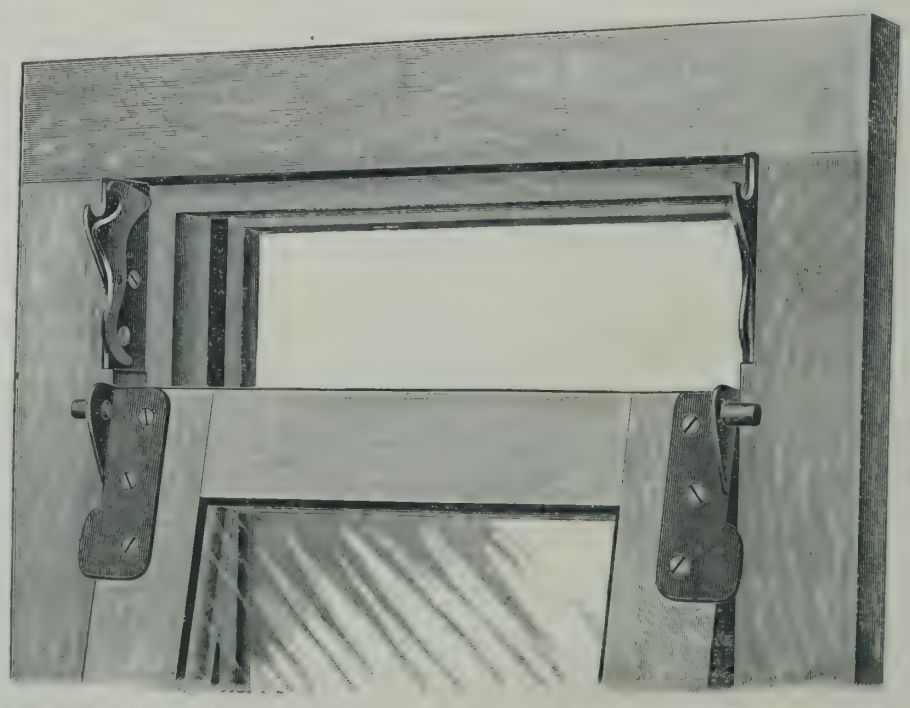
Messrs. McCully and Miles, of Chicago, Ill., have sent us a catalogue describing their stained glass interior decorations. The catalogue is remarkable for the excellence of its colored illustrations, and for this reason alone should be in the possession of every architect.

THE WILLER HANGER.

We present herewith our illustration of the "*Willer Storm Sash Hanger*" applied to storm sash and the window frame.

The cut shows the manner in which the storm sash (or full sized window screen) is slid up along the edges of outside casing until it catches at the top and hangs on the supporting brackets. This is done entirely from the inside of the building.

It will also be noticed from the cut that the hanger can be applied only to square-headed windows. In the case of segment, circular, or other irregularly shaped windows, square headed sash or screens must be used, and the irregular space above filled with separate stationary transoms or boards. The joints should be rabbeted or covered by a moulding to make them as airtight as possible. A full descriptive circular with fine illustrations will be sent on application, by addressing The Willer Manufacturing Company, No. 237 Fourth Street, Milwaukee, Wis.



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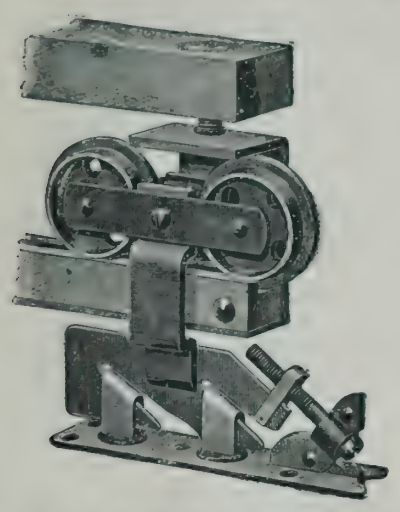

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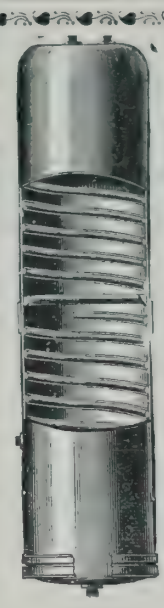

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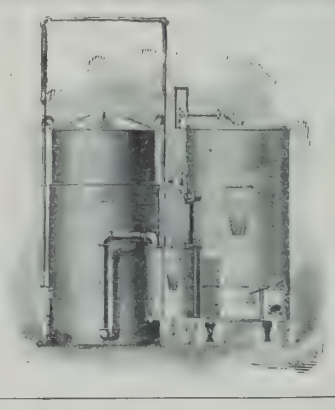

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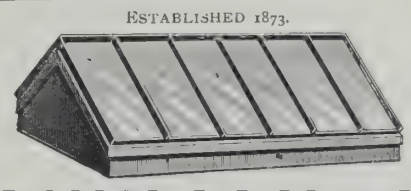

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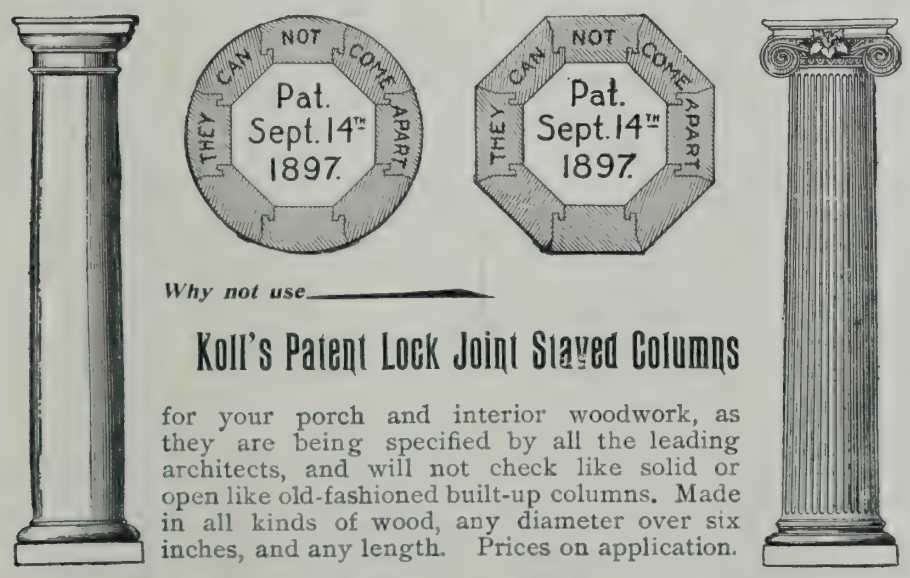

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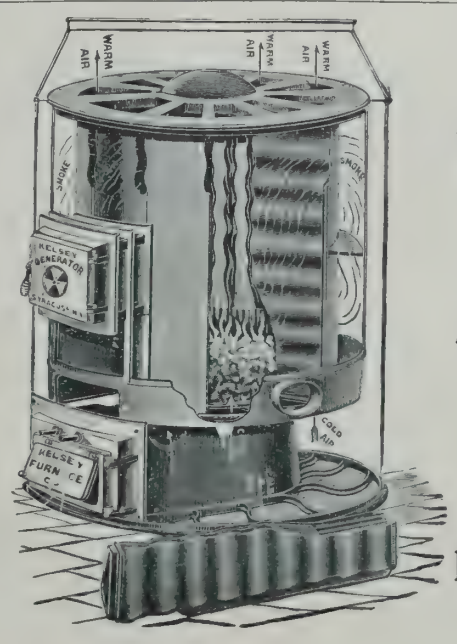

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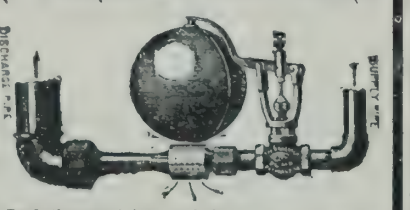

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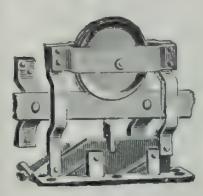

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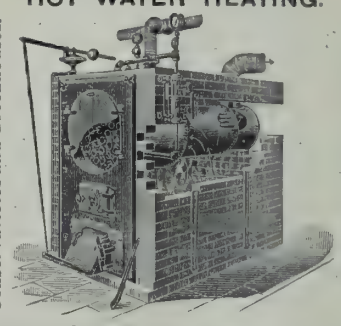

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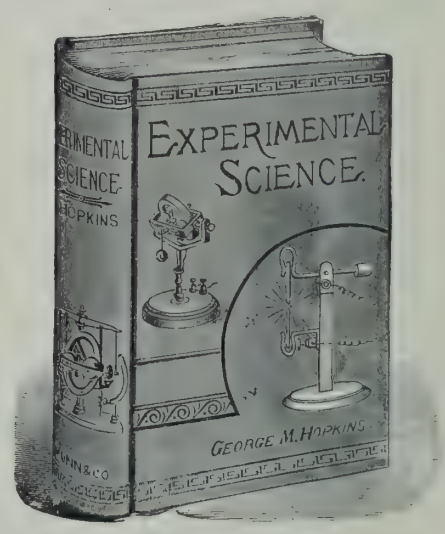

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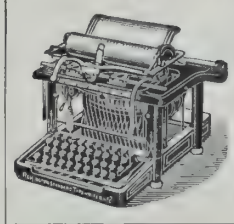

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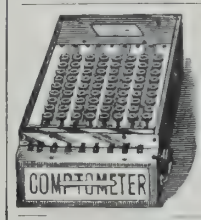

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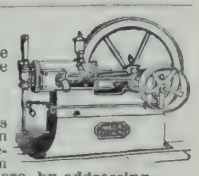

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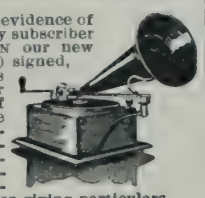

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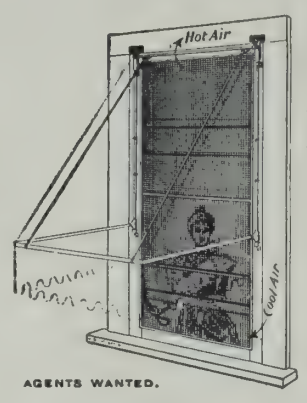

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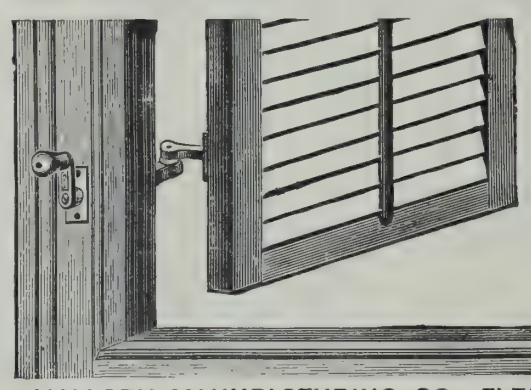

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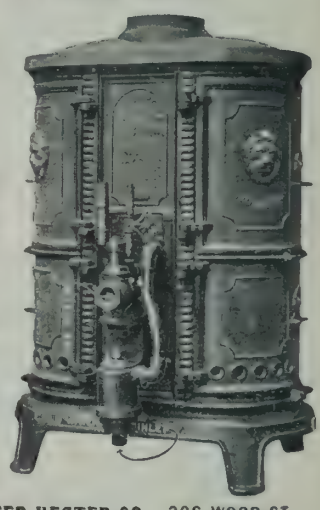

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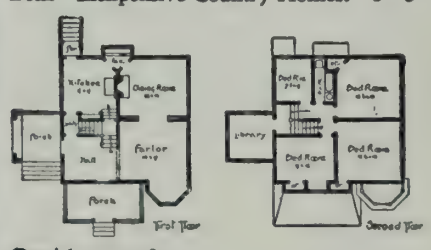

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Building Edition.

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BLANK FOR ONE OF THE GREAT COLUMNS FOR THE CATHEDRAL OF ST. JOHN THE DIVINE.—See page 102.

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THE DEWEY ARCH.

Now that the Dewey Arch has been exposed in its entirety to the gaze of the public for the last two months, it is time to make an estimate of its value as a work of art and its bearing on the sculpture of our country In reality the Arch marks the coming of age of the sculptors. They have now been brought before the public by their noble self-sacrifice of time and labor in behalf of patriotism and of art, and the education of the public is certainly worth all the cost. Sculpture has never been properly appreciated in this country until a few years ago, when we saw at the Chicago Fair an exhibition of the progress of the American sculptor, and since that time, thanks largely to the National Sculpture Society, the public has been kept interested by exhibitions which were unique in the history of Art. The Arch is the crowning of their labors, and when it is perpetuated in enduring material, as there is every prospect of being done, the American School of Sculpture may be said to have become emancipated, and its progress will be even more rapid than in the last ten years.

There was a time, not so long ago, when the sculpture of our parks and public places was nearly all imported. Much of it was "made in Germany," and to-day we can see in New York, Boston, and other cities examples of figures and groups without either construction, modeling, or beauty; all this is now changed, and a ridiculous Boston statue to a Massachusetts military man has at last been replaced by a work of a young American sculptor at the expense of the city In another city, not a great way from the Brooklyn Bridge, a statue which was placed at the intersection of several important thoroughfares is now lying on its face in an Alderman's back yard, and its place is taken by an inoffensive cast-iron drinking fountain, which is at any rate useful if it is not ornamental.

Pictures of the Dewey Arch have appeared in every paper in the United States. It is not unusual to see from five to ten cameras leveled at it at once on a fine day, and it has, without doubt, been photographed more times than any other work or group of statuary.

It might reasonably be asked, whence comes this interest? It is because here we have the result of collaboration of America's first sculptors working on a worthy subject. In the first place, New York and all the great cities have not had adequate facilities for executing such work, although there have been many occasions in the last century which would have warranted the erection of a triumphal arch. It is only within the last few years that American sculptors could have lived in America. It should be remembered that the founders of the American school, such as Powers, Ball, and Story, passed their artistic life in Florence or Rome. Now, however, all that is changed, and we have men who are thoroughly competent to do work of this kind, and Admiral Dewey made the opportunity. The Arch was proposed and discussed over a fifty-cent table d'hôte dinner, at a little Italian restaurant much affected by the elect of the artistic community. Enthusiasm followed interest, and when the call was made the sculptors to a man volunteered their services, dropped their paid commissions, and for six weeks hardly had time to rest, and the result of their labors was probably the most splendid *décor* ever built. Notwithstanding the evanescent nature of the material used, the Arch has an appearance of solidity which is remarkable. The work is a splendid example of what can be done by an association of professional artists who have subjugated all professional interest for the general good, and it speaks volumes in favor of a society like the Sculpture Society.

When it was decided that an arch should be built, the architect, Mr. Charles R. Lamb, selected a type of Roman arch and modified it to meet the peculiar conditions and permit of the addition of large quantities of sculpture. The Arch on its main lines is an enlargement of the Arch of Titus. The prototype would have been entirely too small for the position, and a new penetration was given east and west, and the attic was enlarged so as to give space for the eight colossal figures of naval heroes. The colonnade is a most important adjunct to the Arch, and it simplifies the difficult problem of prolonging and increasing the importance of an elaborate memorial arch. The sculpture on the Arch and on the columns of the colonnade is excellent, and the whole is crowned by the noble group of Victory. Some of the problems were most difficult, such as the proportioning of the colossal statues of naval heroes, the filling of the spandrels, and the four principal groups. The whole arch shows the wonderful harmony which existed between the sculptors. No one piece was allowed to sacrifice its neighbor, and the names of the twenty-five American sculptors who had created this beautiful Arch from barrels of plaster, bales of excelsior, bundles of laths and scantling, cannot be commended too highly for their efforts, which have given sculpture in the United States a most dignified and important position.

THE LATEST APARTMENT HOUSES.

In New York city there are constantly going up hundreds of apartment houses, and improvements are continually being made in them. Much of the increased popularity of the apartments is undoubtedly due to the devices for comfort and convenience which are provided in the newer buildings. Particular attention is now paid to the servants' quarters. They are no longer obliged to sleep in a dark closet, and the servants' room is now nearly as large as the other chambers. In many of the largest apartments a servants' bathroom is also provided. All of the rooms in the latest buildings are arranged as far as possible *en suite*. The old scheme of having the parlor at one end and the dining-room at the other is done away with, and visitors do not have to grope their way down long hallways or past open doors of bedrooms. The parlor, dining-room, reception-room, and library are now arranged so that they can be practically thrown into one room, or can be converted into three distinct apartments at a moment's notice. The sleeping chambers and the bath are frequently reached by a special hall which is cut off by curtains. Several of the apartment houses in New York are what is known as "duplex" apartments. That is to say, the ceilings of the rooms on the front of the house are very high, while the bedrooms at the rear have low ceilings. The result of this economy of space is that a certain number of apartments in an eight- or nine-story building can be provided with a one-story front to the apartment, and a two-story back—access to the sleeping rooms on the second story being obtained by a short staircase. This scheme works admirably, and apartments of this nature are much in demand. Open plumbing and the built-in refrigerator with glass sides have been in use some time, and many apartment houses are provided with a cold storage system which renders the use of ice entirely unnecessary. Many apartment houses nowadays have taken advantage of the ease with which electrical elevators can be installed. They are much less expensive to operate than the ordinary elevators, owing to the fact that no engineers or firemen are required. Electric elevators are easy to operate and are not liable to get out of order.

WORK ON THE NEW CATHEDRAL AT NEW YORK.

The east arch of the Cathedral of St. John the Divine, viewed from the Harlem flats, is most imposing. It is the first of the great arches of the transept and choir. From the keystone of the arch to the ground, the distance is 140 feet. This is less than one-third of the total height of the Cathedral. From the ground to the top of the spire the distance will be 440 feet. The present arch is the first of the four that will outline the transept, so that it is only a fragment of the interior construction, or part of the skeleton, as it were, of the huge edifice. Outside of this the outer walls will rise and completely cover it. The arches and their piers will support a tower and spire, but it will take four years longer to make ready half of the structure for religious purposes. The crypt in the foundation has been in use for some time, and is a little chapel provided with chairs instead of pews. It is lighted by four rich stained glass windows, and is attractively decorated and beautified by the addition of two large tapestries that were once in the Barberini Palace and were executed for Pope Urban VIII. The altar in mosaic glass is very beautiful.

Each pier that supports the arch is composite, having a main member about 24 feet square, and a smaller one within joined to it by masonry to form the footing for the arch. Outside, each of these has a great buttress pier which, some day, will be joined to it above to take part of the thrust which will come from the weight of the tower and spire. The other main piers, auxiliary piers, and buttresses have been laid to the rock, and brought up to nearly the height where the turning of the other arches may be begun, and there are hundreds of tons of stone for adding to them now on the ground. It is undecided at present whether this work shall be proceeded with, or whether an imposing portion of the contemplated structure shall be finished first and used for worship. In the latter case, the choir, which is to the eastward of the great arch, will then be taken in hand. Here a double row of massive foundations have already been laid and built up to the height of the main floor. These are arranged at the eastward end in a semicircle. There are seven of each of these groups of stone work, and the inner ones are for the support of a line of monolithic columns 54 feet high and 6 feet in diameter, and weighing about 130 tons. A blank for one of these has just been successfully quarried and is illustrated on page 101. It was quarried by the Bodwell Granite Company, at Wharff's Quarry, Vinalhaven, Maine. It measures 54 feet in length and 8 feet 6 inches in thickness one way by 7 feet the other, and weighs 310 tons. These columns will be finished at the quarry—a great lathe will be used to turn them—and even in their lightest form their transportation and erection will be an engineering feat of great interest. Arches are to connect these columns, and above them will spring the supports for the roof of the chancel, while the foundations in the outer lines will carry the main supports of that part of the church.

RECTORY OF ST. PETER'S CHURCH, YONKERS, N. Y.

The illustrations shown on page 112, in this issue, present the rectory of St. Peter's Church, at Yonkers, N. Y. The design is treated in the modern style and is simple in form, with the lines well broken to give it an attractive appearance. The interior arrangement is most complete, and it is fitted up in a handsome manner. The building is built of the best materials and in a thorough workmanlike manner. The main interior walls, as well as the exterior ones, are constructed of brick. The underpinning and first story are constructed of the best Haverstraw brick, red in color, and laid up in red mortar. The second story is backed up with brick, while the exterior is coated with a cement plaster and stained a deep yellow color in harmony with the red brick quoins at corners and windows. The trimmings are of red sandstone. The gables and roof are covered with shingles. Dimensions: Front, 38 ft.; side, 45 ft., not including porch. Height of ceilings: Cellar, 8 ft.; first story 10 ft.; second, 9 ft.; third, 8 ft. 6 in. The interior throughout is trimmed with white pine, with the exception of kitchen and its apartments, which are trimmed with ash. The vestibule has a paneled wainscoting and ceiling. The office is conveniently located, and is provided with an entrance to vestibule. The hall contains an ornamental staircase rising up to a broad landing, which is provided with a cluster of stained-glass windows. A coat closet is provided beneath same. The parlor and dining room, of large dimensions, have mullion windows, and the former contains an open fireplace, with tiled facings and hearth, and a mantel made of wood and from a special design. The fireplace and mantel in dining room are built of pressed brick. The kitchen and its apartments are wainscoted, and are fitted up with all the best improved fixtures. The second floor contains the priest's bedroom and study, his assistant's study and bedroom, one guest chamber and bathroom, the latter being wainscoted and furnished with porcelain fixtures and exposed nickel-plated plumbing. The fireplaces are built of brick, with mantels of same. The third floor contains the second assistant's bedroom and study, two servant bedrooms, and one guest chamber. A cemented cellar contains furnace, laundry, and ample storage room. The contracts were as follows: Mason work, $3,550; carpenter work, $4,100; plumbing and heating, $1,150, and gas fixtures, $114. Total, $8,914. Messrs. O'Connor & Metcalf, architects, 108 Fulton Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A COLONIAL RESIDENCE, STABLE, AND POWER HOUSE AT RIDGEFIELD, CONN.

We present herewith in this issue, on pages 103, 104 and 105, a colonial residence, and, on page 106, a stable and power house, which have been recently completed for Allen S. Apgar, Esq., at Ridgefield, Conn. The engravings and illustrations present a fine example in colonial architecture; great attention and study being given to the detail, both on the exterior and interior. The exterior has a spacious piazza surrounding the building, together with a porte-cochère at rear of the house. The underpinning is built of blue granite, with rock faces. The openings under the piazza are filled in with ornamental iron work. The colonial columns on piazza have hand carved Ionic capitals. The superstructure is of wood, and the exterior frame work is sheathed, covered with paper, and then clapboarded and painted old colonial yellow; the cornice and all trimmings are painted ivory white. The roof is covered with shingles

and allowed to weather. The chimneys are built of buff brick. The building is constructed in a thoroughly substantial manner, and all walls and partitions in cellar are built of stone 16 in. and 18 in. in width. Dimensions: Front, 75 ft.; side, 80 ft. 8 in.; not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 10 ft. 6 in.; second, 9 ft. 6 in.; third, 8 ft. 6 in. The interior arrangement is most excellent, and it contains a great number of very large and spacious rooms. The grand hall and its communicating apartments are exceedingly attractive. This hall and all the principal rooms are trimmed with white pine treated with white enamel and have paneled wainscoting. The hall has massive ceiling beams, as well as the library, drawing and dining-room. The broad staircase is built of oak treads, while the balusters and rail are of San Domingo mahogany. The broad landing, with swell balcony effect, is provided with a stained-glass window of most exquisite design, representing a rose vine with light coming in between

VIEW OF HALL.—A COLONIAL RESIDENCE AT RIDGEFIELD, CONN.—See page 102.

the branches, made by Parker. The grand, stately fireplace is another important feature of this hall. It has a finely carved fascia surmounted by a mantel shelf, while the whole is supported upon fluted columns with Ionic capitals, lined on each side and top with handsomely colored Pavonazzo marble. The hearth is laid within rich tiling. The archway at the entrance is supported on similar columns as the mantel shelf, and the entrance door is in the Dutch style, while the windows, at side and over same, are very artistic in detail, being exact copies of the very old colonial style. The nook at side, with paneled seats, is also an attractive feature. The drawing-room, broad and spacious, is handsomely treated, and it contains an open fireplace, decorated with handsome tiling. The morning-room is treated similar, and it has also an open fireplace. The library is attractive in its proportions, and is treated in china white. The walls have paneled wainscoting on one side of room, while the spaces on the opposite side are provided with book-cases built in of mahogany. The nook at side, separated by an archway, with columns, is provided with similar book-cases, and is an attractive feature. The fireplace is also nicely decorated with warm-colored tiling. The den adjoining is treated in a similar manner. The office is located conveniently, and has an outside entrance. The dining-room is one of the attractive apartments, and is finished off in an elegant manner. It has a paneled wainscoting and ceiling beams, forming deep panels. There is a nook built in for buffet, at either side of which is a china cabinet built in, with leaded glass doors. The fireplace has a hearth and facings of tiling, and a mantel of excellent design of colonial style, with columns, etc. The butler's closet is trimmed with oak, and is fitted up in a very complete manner with drawers, cupboards, and closets. The kitchen, laundry, and servants' dining-room are trimmed with yellow pine, and are furnished with all the necessary appurtenances complete. The second floor contains six bedrooms, three bathrooms, and dressing-room. The bedrooms have open fireplaces, with tiled facings and hearth, and colonial mantels. The bathrooms are wainscoted and treated with white enamel, and are provided with porcelain fixtures and exposed nickel-plated plumbing. The extension on this floor contains three servants' rooms and bath, with private stairway to kitchen. The third floor contains a billiard-room, three bedrooms, trunk-room, and ample storage. The floors on first and second stories are doubled, the top layer being of quartered oak and highly polished, while the kitchen extension and third story floors are of yellow pine. The windows are glazed with French plate glass. A cemented cellar under the entire building contains two hot-water heaters, J. L. Mott system, together with numerous other necessary apartments. Mr. Christopher Myers, architect, 361 Broadway, New York, N. Y.

The stable, which we illustrate on page 106, was also designed by Mr. Myers for Mr. Apgar, and is also built at Ridgefield, Conn. It is constructed of field stone laid up at random. The wood trimmings, cornice, and frieze are painted white. The roof is covered with shingles weather stained. Dimensions: Front, 40 ft. 8 in.; side, 62 ft. 4 in., not including piazza. Height of ceilings: First story, 10 ft.; second, 8 ft. 6 in. in the finished part. The interior walls, partitions, and ceilings are ceiled up with narrow beaded yellow pine, finished in hard oil. The carriage-room is cemented on the bottom, and being of large dimensions contains ample room for numerous carriages, etc. The stable contains a man's dressing-room, harness-room, with closets provided with sliding glass doors, and feed room, two box stalls and four single stalls. These apartments are provided with all the necessary ornamental iron fixtures, and are fitted up complete in every respect. The second floor contains the coachman's quarters, consisting of one large living-room, kitchen, and bedroom, besides ample storage room for feed and hay. The other engravings shown on page 106 illustrate the power house, which is located at the rear of the dwelling and above the level of the roof lines of the main house. The interior of the power house, presented on same page, shows how little space an electric plant can be made to occupy. A ten-horse power Westinghouse gasoline engine is here direct-connected to a Westinghouse dynamo, and is also belted to a pump. The plant stands about 500 feet distant from the residence, the electric current being conveyed by insulated cables placed under, ground. Adjoining and beyond, as shown in the engraving, is the reservoir, which is filled daily by the pump, and supplies the residence, stable, green-houses, and grounds. This engine also lights the grounds, stable, and residence by electricity. Mr. Apgar has a small electric motor mounted on a truck, easily transported from place to place, the electric current being conveyed to it by means of a flexible cable. This motor is used for many purposes, such as operating a stone crusher, drilling, chopping feed for live stock, etc. The plant is also arranged for supplying power to a small machine shop equipped for the amusement of the owner. Mr. Christopher Myers, of 361 Broadway, New York, N. Y., was the architect.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

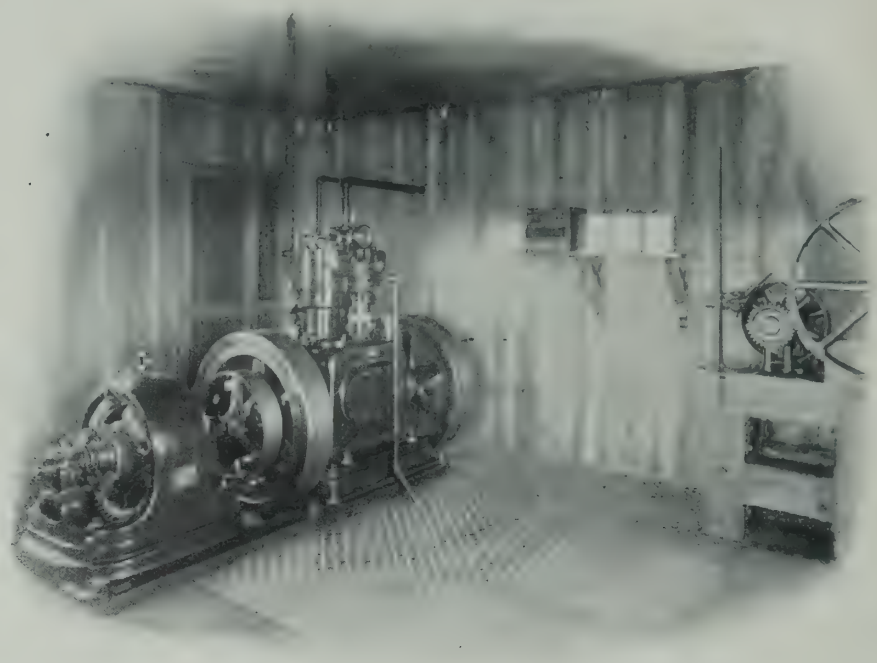
BERLIN is soon to have an architectural museum on a large scale. It will be built on a site near the Royal Technical College at Charlottenburg. Every effort will be made to make the new museum thoroughly representative, and the importance of an easily accessible museum of this kind for those studying their profession cannot be overrated.

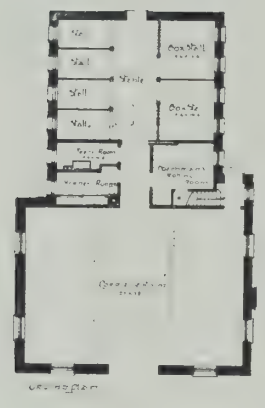
A COLONIAL RESIDENCE AT RIDGEFIELD, CONN.—See page 102

MR. CHRISTOPHER MYERS, ARCHITECT.

A COLONIAL RESIDENCE AT RIDGEFIELD, CONN.—See page 102.

MR. CHRISTOPHER MYERS, ARCHITECT.



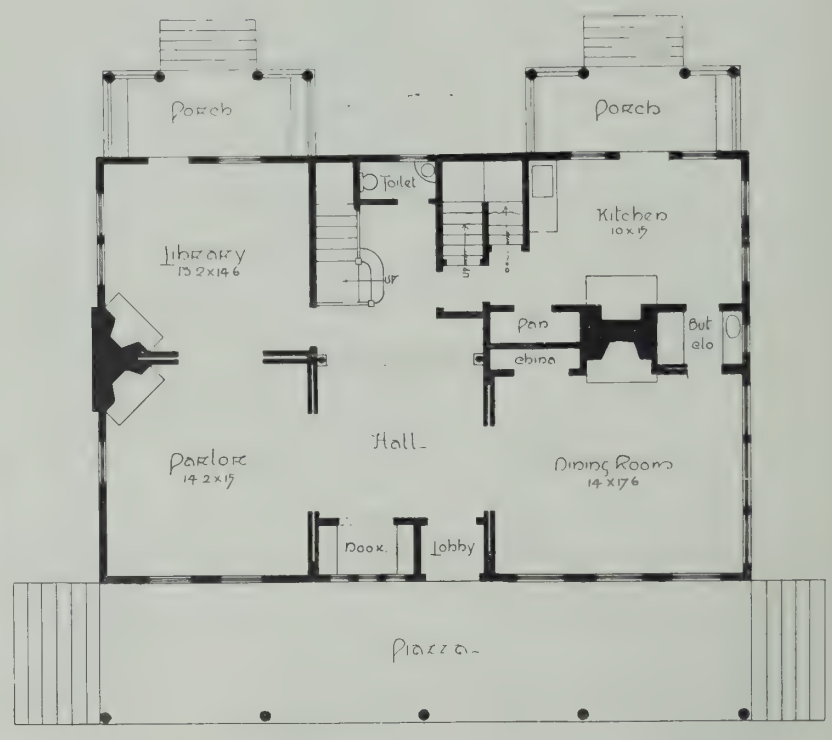


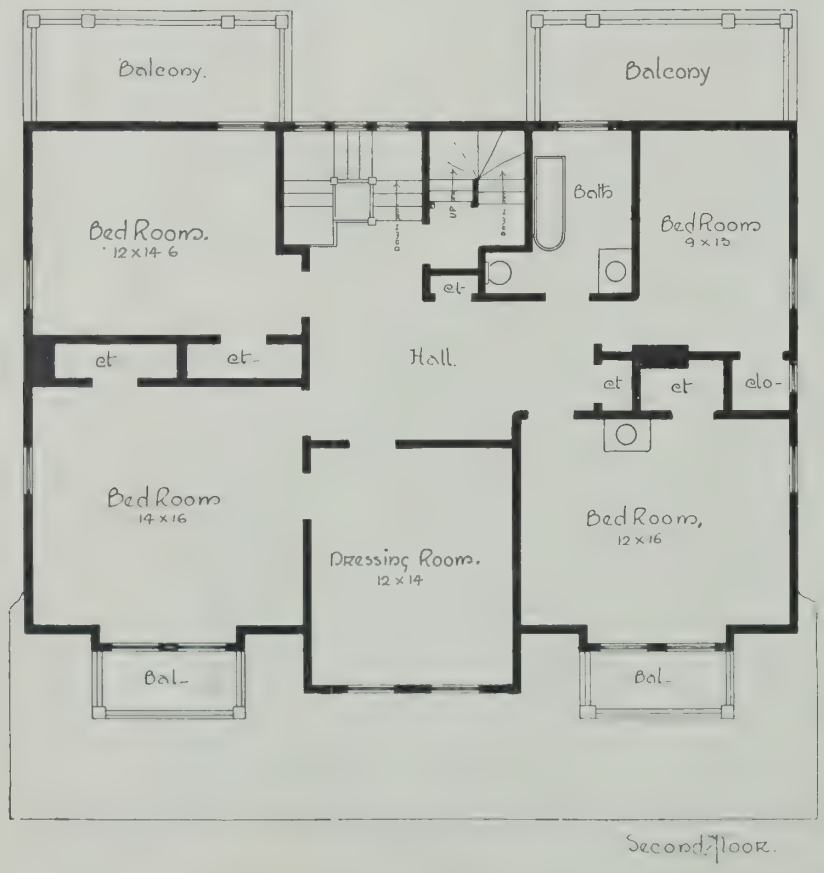
STABLE AND POWER HOUSE AT RIDGEFIELD, CONN.—See page 102.

MR. CHRISTOPHER MYERS, ARCHITECT.

A MODERN COTTAGE OF LOW COST AT LARCHMONT, N. Y.—See page 117.

MR. S. EDSON GAGE, ARCHITECT.

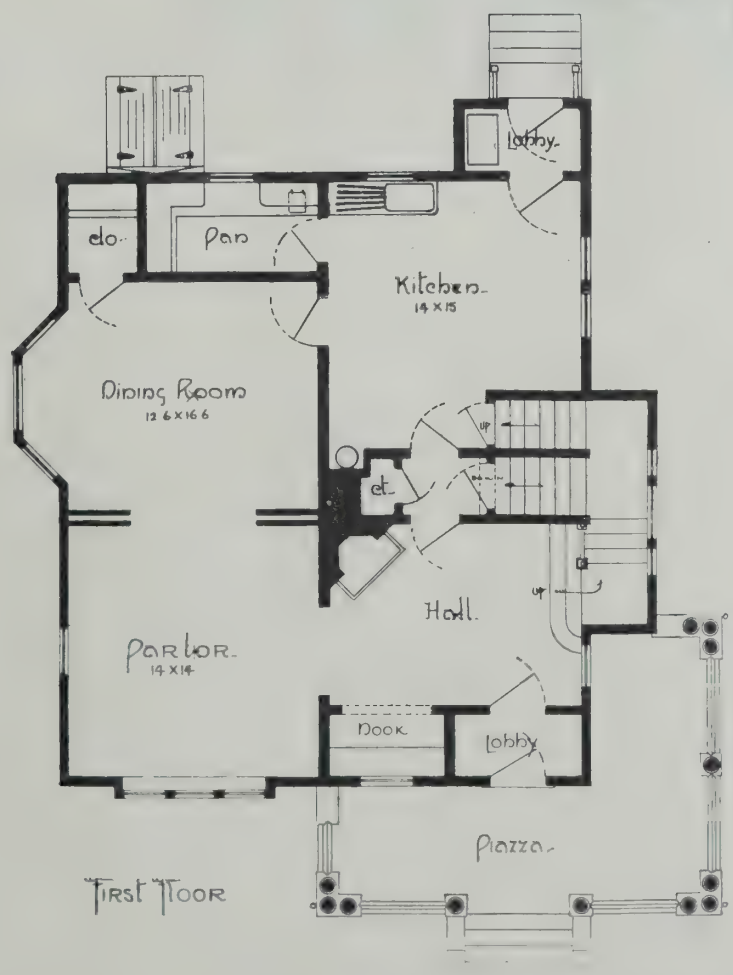


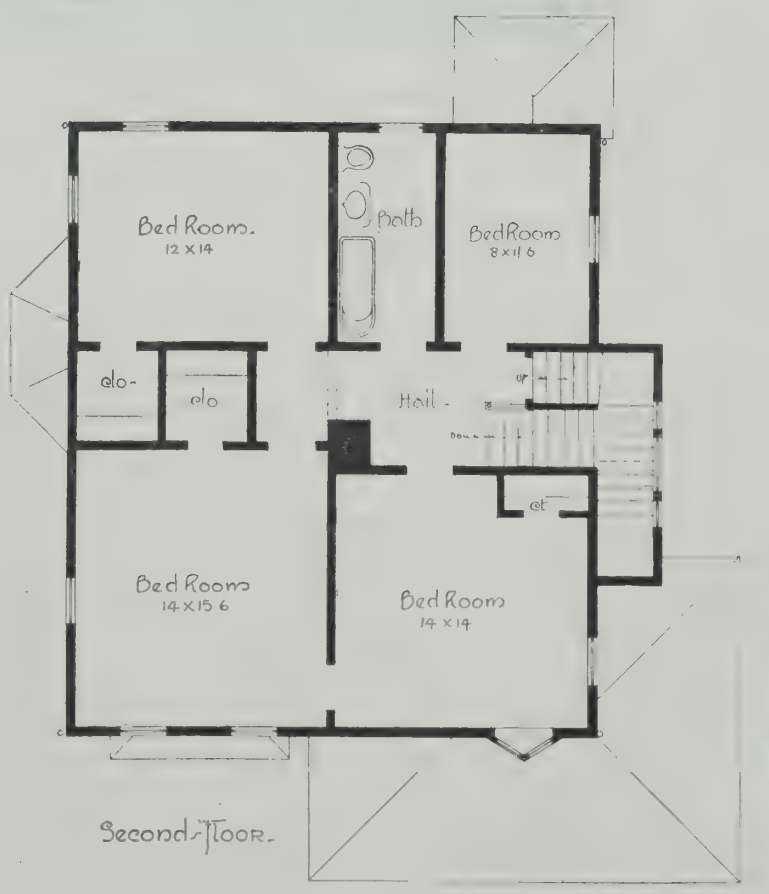


BOSTON PUBLIC

A MODERN COLONIAL HOUSE AT GREENWICH, CONN.—See page 115.

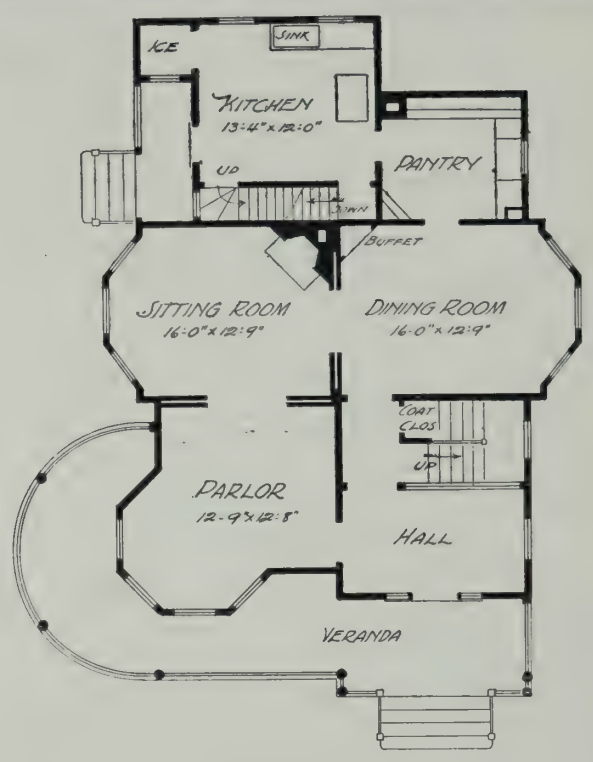
MR. FREDERICK G. C. SMITH, ARCHITECT.





A MODERN DWELLING AT BRIDGEPORT, CONN.—See page 117.

MR. W. P. BANKS, ARCHITECT.



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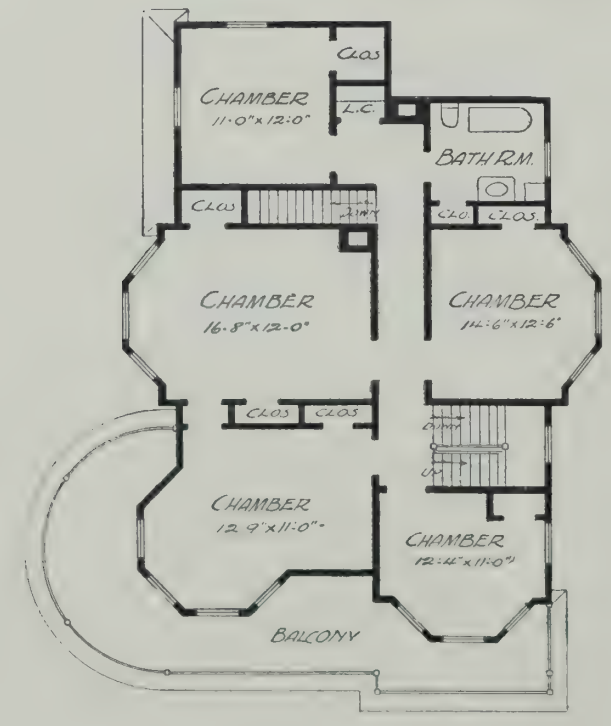
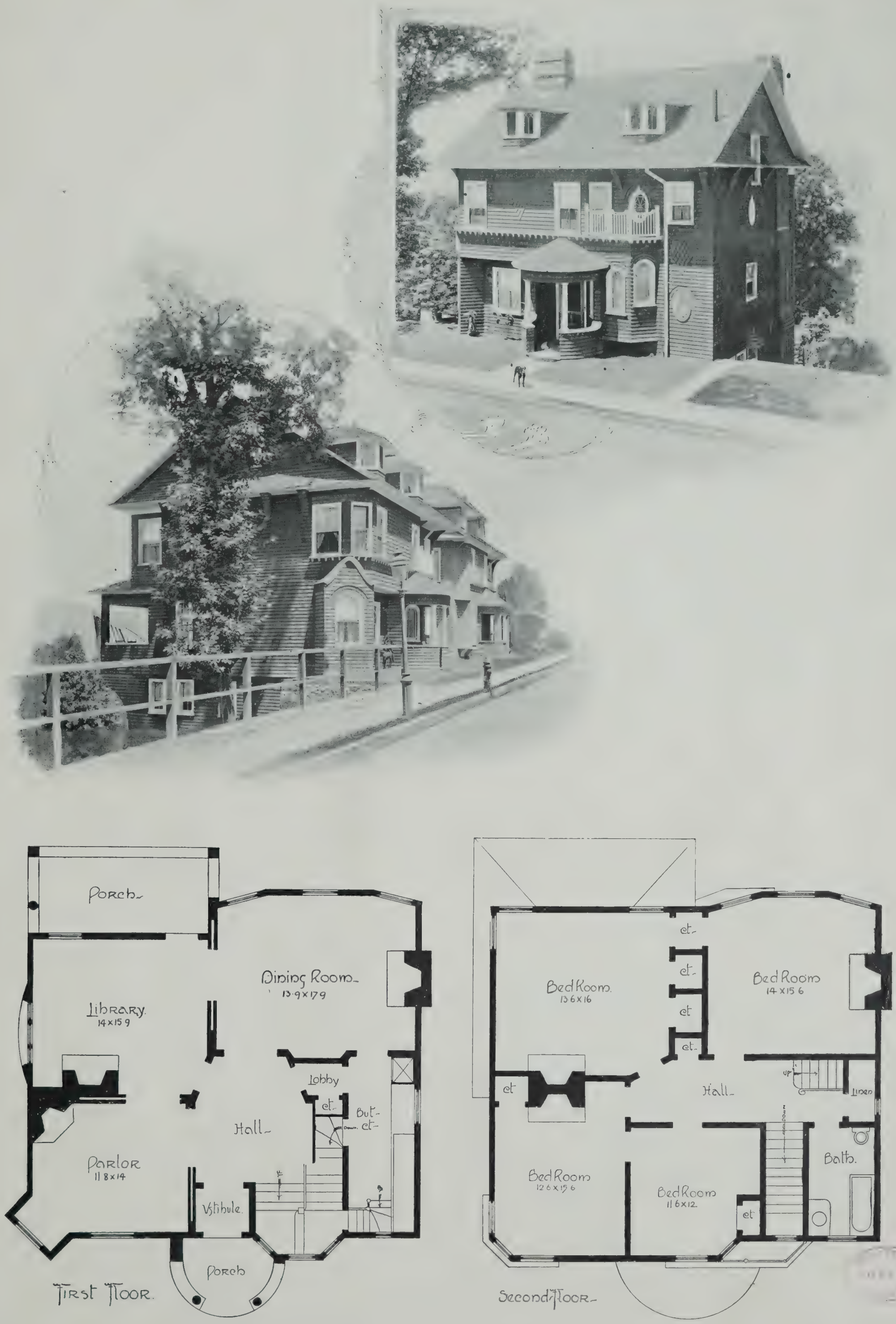


SECOND FLOOR PLAN

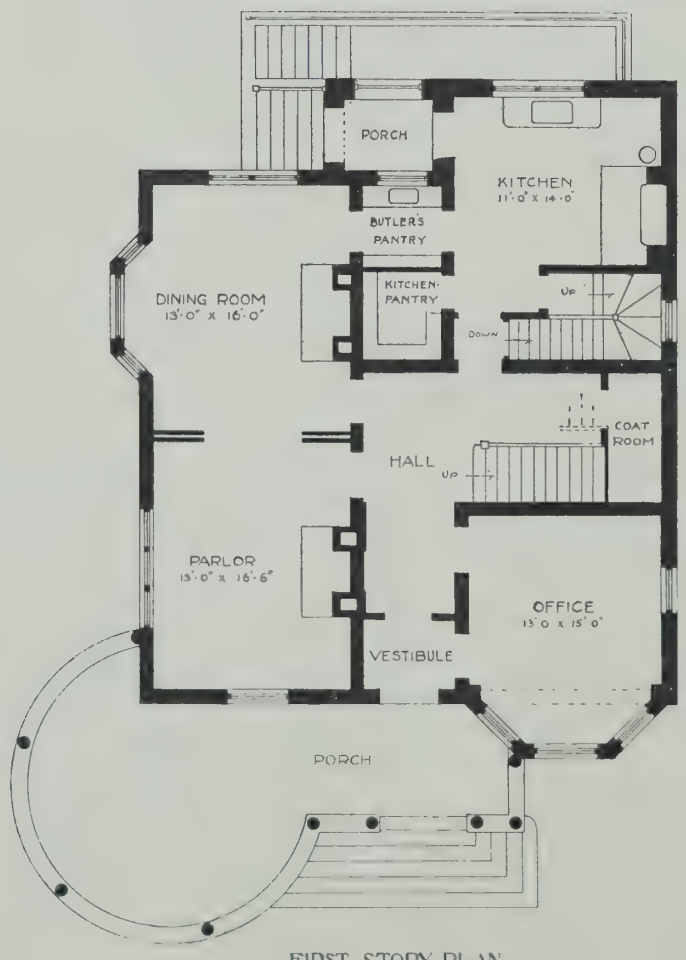
A MODERN DWELLING AT STONEHAM, MASS.—See page 117.

MR. E. R. B. CHAPMAN, ARCHITECT.

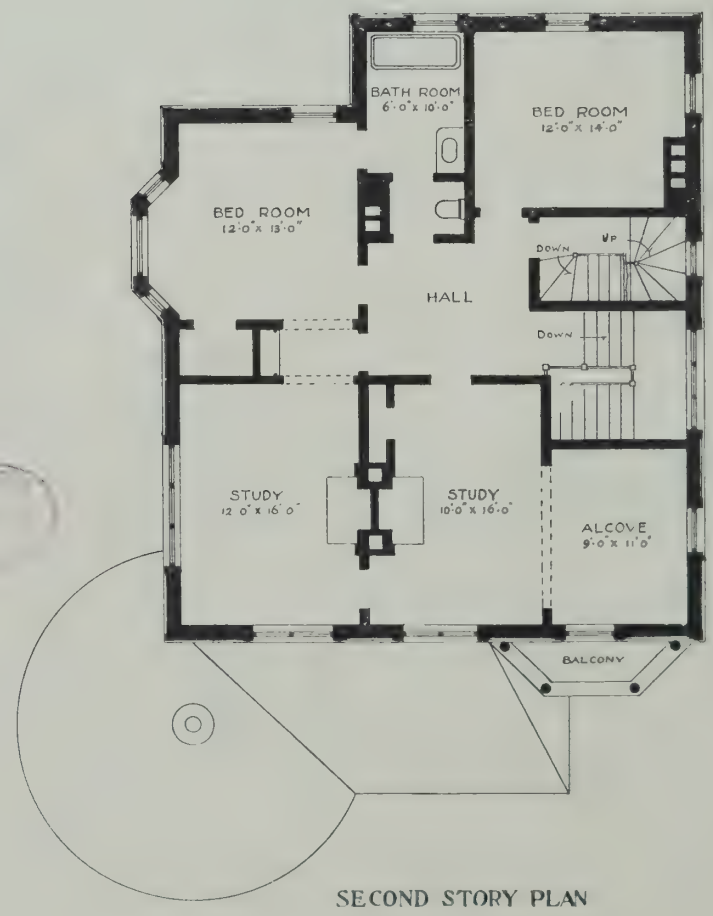


A MODERN DWELLING HOUSE AT YONKERS, N. Y.—See page 117.

MR. G. H. CHAMBERLAIN, ARCHITECT.



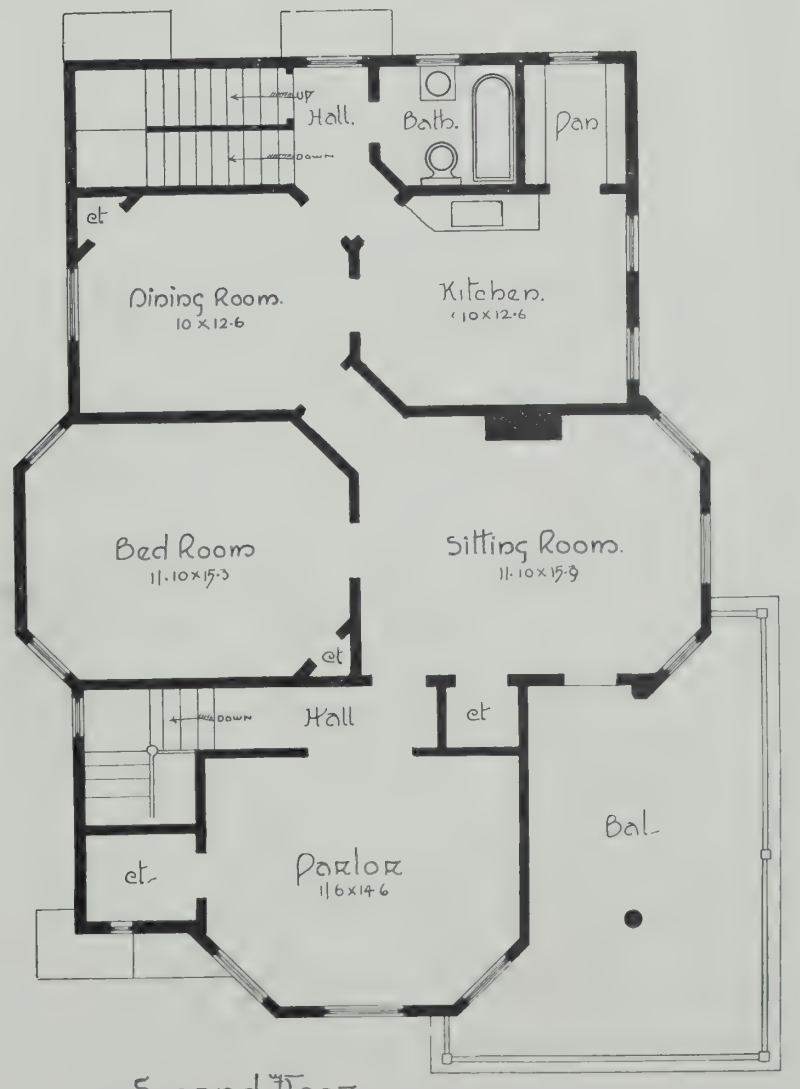
FIRST STORY PLAN



SECOND STORY PLAN

RECTORY OF ST. PETER'S CHURCH AT YONKERS, N. Y.—See page 102.

MESSRS. O'CONNOR & METCALF, ARCHITECTS.



A TWO-FAMILY FLAT HOUSE AT HARTFORD, CONN.—See page 115.

MR. W. H. SCOVILLE, ARCHITECT.

A RESIDENCE AT HARTFORD, CONN.—See page 115.

MR. F. R. COMSTOCK, ARCHITECT.

A MODERN COLONIAL HOUSE AT GREENWICH, CONN.

THE engravings shown on page 108 in this issue illustrate a modern dwelling house of colonial treatment which has been erected for Richard A. White, Esq., at Greenwich, Conn. The design combines both excellent elevations and well-arranged plans. It has many attractive features, including spacious and well-shaded piazzas, porches, balconies, dormer windows, and the field stone fence at front which is a feature in itself. The underpinning at piazza is built of similar stone, while the remainder of the underpinning is constructed of rock-faced stone. The exterior framework is covered with sheathing and paper. The first story is covered with clapboards and painted colonial gray with white trimmings. The second story is covered with shingles and painted a similar color. The roof is covered also with shingles and stained to a dull, dark green color. Dimensions: Front, 46 ft.; side, 30 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 10 ft.; second, 9 ft.; third, 8 ft. The vestibule and hall are trimmed with quartered oak. It contains a nook with paneled seats and a cluster of leaded glass windows. The reception hall is separated from staircase hall by an archway with spindle transom. The staircase is an ornamental one with turned newels, posts, and balusters. The toilet beneath the same is a convenience. The parlor is treated in white and gold, and it contains an open fireplace trimmed with white enamel tiled facings and hearth and mantel. The library is trimmed with sycamore, and it contains an open fireplace with tiled trimmings and mantel and a door opening out upon porch. The dining-room is trimmed with cypress, and it has a china closet, an open fireplace, numerous windows, and a butler's closet fitted up complete with drawers, shelves, cupboards, and bowl. The kitchen and its dependencies are wainscoted and are fitted up with the best modern conveniences. The second floor is trimmed with cypress, finished natural. It contains four bedrooms, one large dressing room, six closets, and bathroom. The bathroom is wainscoted with tiles and is furnished with porcelain fixtures and exposed nickel-plated plumbing. The third floor contains one bedroom and ample storage. A cemented cellar contains laundry, furnace, and other necessary apartments. Cost, $6,500, complete. Mr. Frederick G. C. Smith, architect, Greenwich, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A RESIDENCE AT HARTFORD, CONN.

THE engravings shown on page 114 and below illustrate a residence of colonial treatment, which has been erected for M. A. Norton, Esq., at Hartford, Conn. The building is treated in the gambrel roof style with colonial detail, and it has many attractive features, including the piazzas, bay-windows, latticed window effects, etc. The underpinning is built of rock-faced red sandstone. The superstructure is of wood, and is covered on the exterior with shingles stained a Van Dyke brown, while the trimmings are painted white. The roof is stained in harmony with the remainder of the building. Dimensions: Front, 44 ft.; side, 36 ft., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 9 ft. 6 in.; second, 8 ft. 6 in.; third, 8 ft. The interior throughout is trimmed with white pine treated in white enamel. The doors are stained and finished in mahogany. The most attractive feature of the interior is the hall and reception-room, which occupies the entire front of the building, the only division between the two apartments being the archway and spindle transom, which are supported upon fluted columns. The staircase is a feature in itself; it rises up from a broad landing with seat at side, is inclosed, and partially isolated from view. The fireplace is an open one, with facings and hearth of tiles, and a mantel of handsome design with fine carvings. The reception-room is provided with a bay window and flower shelf. The dining-room is separated from hall by an archway with fluted columns rising from a paneled base and finished with spindle transoms. This dining-room of good dimensions is provided with a nook for buffet. The kitchen and pantries are wainscoted, and are furnished with all the best modern conveniences. The second floor contains four bedrooms, large closets, and bath-room; the latter wainscoted and fitted up with porcelain fixtures and exposed plumbing, all nickel-plated. The third floor contains the servants' quarters and ample storage. A cemented cellar contains furnace, laundry, and other necessary apartments. Mr. F. R. Comstock, architect, 124 West Forty-fifth Street, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A TWO-FAMILY FLAT HOUSE AT HARTFORD, CONN.

WE present on page 113 in this issue a modern two family flat house, which has been erected for Messrs. C. C. Prentice and Geo. W. Finlay, at Hartford, Conn. The engravings present a design with good elevations and well-arranged interior plans. The building is planned for two families, one on each floor, occupying a suite of five rooms and bath, and each entirely separated one from the other, and having private entrance-way at front and rear. The underpinning and a part of first story are built of Glastonbury granite with rock faces. The remainder of the building of wood is covered on the exterior with shingles stained a moss green. The roof is also shingled. Dimensions: Front, 32 ft.; side, 44 ft.; not including piazza. Height of ceilings: Cellar, 7 ft.; first-story, 9 ft.; second, 9 ft.; third, 8 ft. The interior throughout is trimmed with cypress finished natural. The parlor and sitting-room are separated on first floor by an archway. Each has neat wood mantels. The dining-rooms have corner china closets. The kitchens have wainscotings, sinks and large, well fitted up pantries. The bathrooms are wainscoted, and are furnished with the usual fixtures and exposed plumbing. The third floor contains two bedrooms for each family, besides ample storage. A cemented cellar contains a furnace, laundry and other necessary apartments. Cost complete, $4,500. Mr. W. H. Scoville, architect, Hartford, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

INTERIOR VIEW.—A RESIDENCE AT HARTFORD, CONN.

AVENUE LEADING TO THE VILLA OF POGGIO IMPERIALE, NEAR FLORENCE.

PANORAMA OF THE GARDENS OF THE VILLA FABBRICOTTI.

TWO FLORENTINE VILLAS.—See page 117.

TWO FLORENTINE VILLAS.

THE whole country around Florence is one of the greatest loveliness, and on passing out of any gate the visitor finds himself beneath the walls of villas and beside cypress hedges, inclosing fair terraced gardens, where the masses of oleander and magnolia break away at intervals to show the bends in the Arno, or the peaks of the Carrara Mountains When an elevation is reached there is that matchless panorama of Florence unfolded to the view, Brunelleschi's dome, the Campanile, the soaring tower of the Palazzo Vecchio, and the long line of Santa Croce, and the lesser towers of the Badia and the Bargello. In the early seventies when Florence was the provisional capital of United Italy, a scheme of the most comprehensive character was adopted, which well nigh ruined the municipality—this was the laying out of a splendid system of boulevards in the environs. They run from the Porta San Niccolò to the Porta Romana, going up and down the hills, and as they constantly wind they present a new view of Florence at every turn. The superb road shaded by splendid trees cost several millions, but, unfortunately, the Florentines do not realize that the panorama presented from this road is without an equal, for they have allowed a portion of it to be taken up by a steam tramway, and, for aught we know, the steam road may have become a trolley road, for the Italians have the fever of improvement badly Not far from this road is the splendid avenue leading directly in a straight line from the gate of Florence to the Poggio Imperiale, of which we give an illustration on page 116. This alley of cypresses, larches, and evergreen oaks furnishes one of the most impressive walks in the world It is embellished by a few statues which do not call for special comment, except as showing how sculpture composes admirably with landscape gardening Twenty minutes' walk up this avenue leads to Villa Poggio Imperiale. It was thus named and almost entirely fitted up by Magdalena of Austria, wife of Cosimo II , in 1622. It is now a girls' school. Near is the hill of Arcetri, so celebrated by Redi, in his '*Bacco in Toscana*,' for its wine. Our other engraving shows the view obtained from the Villa Fabbricotti in the environs It was formerly the Villa Strozzi, and also belonged to the Medici. Even in the earliest days it was known for its solemnly picturesque growth or cypresses The villa itself is an ugly pile, but the view from it, through the evergreen oaks and cypresses, is very beautiful. It was the residence of Queen Victoria during her visit in the spring of 1894

A MODERN DWELLING AT STONEHAM, MASS.

THE engravings on page 110 show a cozy home built for Mr James Cogan, Elm Street, Stoneham, Mass. The exterior is very attractive The main portion from water table to coving is clapboarded and painted a deep olive green The cornice with its deep overhang at bays, is supported by hand carved brackets, and with the rest of the trimmings is painted cream white The gables are shingled and stained a deeper green, and have cream white verge boards. The underpinning where exposed is of moss-grown field stone wiped out in black mortar. The exterior dimensions are 27 ft front, and 42 ft. back. Height of stories First, 9 ft 6 in ; second, 8 ft 4 in.; third, 8 ft First floor is finished as follows Parlor in white enamel, tinted ceiling, heavy pressed paper on wall. Hall in dark oak, maple floor, dark green ingrain paper Sitting room in enamel white with mahogany columns at mantel, and mahogany doors. Dining room is finished in oak, with an oak floor. The buffet has leaded glass doors The walls are covered with wine color ingrain paper Kitchen and dependencies in North Carolina pine Second floor is finished entirely in whitewood, painted and natural. The attic has a servant's room and large billiard room The cemented cellar contains a laundry, toilet room, etc., and a large store closet partitioned off from main cellar by brick walls. The house is heated by a New Model Hot Water Heater, radiators to sitting room, parlor, and dining room being indirect Cost complete, including heating, $8,500. Mr E R B Chapman, of Rand & Chapman, 6 Beacon Street, Boston, was the architect

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN DWELLING HOUSE AT YONKERS, N. Y.

WE present on page 111 in this issue a modern dwelling house which has been erected for W H. Lake, Esq., at Yonkers, N Y The site is on a side-hill, and as the descent is a sudden one, an opportunity is given to utilize the basement of the building, whereby a building with three and a half stories is obtained at the rear, while only two and a half stories are secured at the front. The design is admirable, and is treated in a modern American style, with colonial detail. It has many attractive features, including bay windows, porches, chimney, and the ornamental windows. The foundation is built of stone. There is no underpinning The building above, from foundation to peak, is covered with sheathing, paper, and cedar shingles, left to weather finish a natural silver gray The trimmings are painted cream white. The roof is shingled, and is finished natural Dimensions Front, 36 ft.; side, 33 ft. not including piazza. Height of ceilings: Cellar, 8 ft.; first story, 9 ft. 6 in.; second, 9 ft.; third, 8 ft 6 in. The plan is arranged most excellently, and the interior is finished off in a unique manner. The interior throughout is trimmed with brown ash, and finished natural. The vestibule has a paneled wainscot. The main hall contains a paneled divan and an ornamental staircase, with turned newel posts, balusters, and rail. The parlor and library are connected by a sliding door, and each is furnished with open fireplace fitted up with tiled facings and hearth and mantel of excellent design. The dining-room of good dimensions is provided with an open fireplace, treated same as the ones already described. The second floor contains four bedrooms, seven large closets and bathroom. Three of the bedrooms have open fireplaces The bathroom is wainscoted and furnished with porcelain lined tub, other necessary fixtures and exposed plumbing. The third floor contains three bedrooms and trunk room. The basement contains a well fitted up kitchen, laundry, pantry, furnace room and cold storage. These apartments are furnished and fitted up with the best modern convenience. Mr. G. H. Chamberlain, architect, 1193 Broadway, New York city, N. Y

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN

A MODERN DWELLING AT BRIDGEPORT, CONN.

THE engravings shown on page 109 in this issue illustrate a modern dwelling, which has been erected for Mr F D Robertson at Bridgeport, Conn. The design is admirable, and it combines both good elevations and well arranged plans. The underpinning is built of mottled buff brick. The superstructure, of wood, is covered on the exterior framework with sheathing, paper, and shingles, and then stained a Van Dyke brown, with cream white trimmings. The roof is stained a moss green. Dimensions Front, 35 ft. 6 in ; side, 34 ft not including piazza. Height of ceilings Cellar, 7 ft . first story, 9 ft. 6 in : second, 9 ft. . third, 8 ft. The hall is trimmed with ash, and it contains a nook with paneled seat, and an ornamental staircase with newel, posts, and balusters turned out of similar wood The fireplace is built of brick, with facings and hearth of tile and a mantel of ash. The parlor is trimmed with ash, and is provided with a flower shelf at front and a cluster of three windows The dining room is also trimmed with ash, and it has a china closet built in The kitchen and pantries are trimmed with cypress, and are furnished with the usual fixtures complete. The second floor contains four bed rooms, large closets, and bath-room trimmed with cypress This bath room is wainscoted, and is fitted up with porcelain fixtures and exposed plumbing. The third floor contains the servant quarters and bath, besides ample storage. A cemented cellar contains furnace, laundry, and other necessary rooms. Cost, $3,300, complete Mr. W. P Banks, architect, Bridgeport, Conn.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

A MODERN COTTAGE OF LOW COST, AT LARCHMONT, N. Y.

WE present herewith, on page 107 in this issue, a modern cottage of low cost, which has been erected for A B. Duffy, Esq., at Larchmont, N. Y The design is admirable, and it is a difficult matter to secure a design with a combination of excellent exterior elevations and well arranged plans as presented herewith and at so low a cost There is a cemented cellar under the whole building containing all the necessary apartments. It has a foundation wall inclosing same, built of rough stone in a good workmanlike manner, from which rises an underpinning built of rock-faced stone laid up in a neat manner. The exterior framework above is covered with sheathing and then cedar shingles, and left to weather finish natural. The trimmings are painted buff. The roof is shingled. Dimensions: Front, 22 ft. 4 in.; side, 24 ft. 6 in., not including piazza. Height of ceilings: Cellar, 7 ft.; first story, 8 ft.; second, 8 ft. The interior plan is most unique and complete, and the whole is trimmed throughout with whitewood and painted in colors. The floors are laid with yellow pine in narrow widths. The living room, or parlor, is provided with a mantel of wood. The dining-room has a large closet, and is connected with kitchen, which is of good size, and contains an open fireplace for range, large pantry, and sink. It is wainscoted with narrow beaded stuff. The second floor contains three bedrooms of good size, with closets. Cost, $1,400, complete. Mr. S. Edson Gage, architect, Lincoln Building, No 3 Union Square, New York.

Our engravings were made direct from photographs of the building, taken specially for the SCIENTIFIC AMERICAN.

THE Eiffel Tower is undergoing a complete renovation in preparation for the forthcoming exposition. The entire structure will be painted with an enamel in five shades. The Mechanical Engineer states that nearly fifty tons of enamel will be employed.

Is a House Sewer Trap Always Necessary?

BY CHARLES B. BALL, M. AM SOC C. E. INSPECTOR OF PLUMBING WASHINGTON, D. C

THE writers who have in recent years discussed drainage and sewerage questions concur in the opinion that liquid domestic wastes must be conducted, as speedily as possible, from the plumbing fixtures in which they are formed, through the house drains and the lateral and main sewers to the outfall of the system

In order to accomplish this desirable result, the ideal sewage conduit is supposed to have a smooth and impervious surface, few and thin joints, sufficient and uniform gradients, good alignment with easy curves, a size not excessive in its relation to the work performed, and to be provided with efficient means of ventilation.

Those engineers who are practiced in the construction of drainage works realize that these conditions are usually but imperfectly fulfilled, yet the desirability of approximating to them so closely as may be is not questioned

Admitting the validity of these fundamentals of design and comparing approved practice with such standards we observe at once an anomalous circumstance in the presence in each house sewer line of an intercepting trap, which destroys the ideal conditions by disturbing the course of stream flow, decreasing its velocity, hastening the deposit of suspended matters, and preventing a general circulation of air through the sewers and house drains

Frequent objection is made to this appurtenance by the intelligent plumber, who finds it often obstructed, by the skillful architect, who is unable to fix upon a suitable location for the required air inlet and by the sewer engineer who notes with a jealous eye the open ends of hundreds of house soil pipes, rendered unavailable, by the prescribed construction, for the ventilation of the public system

While the present writer must not be understood as advocating the universal abolition of the main trap, it is his object to determine more fully the grounds on which it is stated to be a necessity and to inquire if the omission of this appliance may not sometimes be safely accomplished

The use of an intercepting trap is based upon the assumption that it is necessary to prevent the intrusion of air from the public sewers to the house piping system and that varying air pressures must necessarily occur in the sewers, which will, if freely admitted to the house lines, endanger the trap seals of plumbing fixtures While it is unquestionable that the displacement of the air contained in public sewers by the sudden entrance of storm water is very rapid, and that compression is likely to prevail, it would seem that the most ready means of avoiding damage to the house traps would be to provide ample means for the escape of air at many points, as would be the case were every house trap omitted, rather than to convert the main sewer into a sealed chamber the air pressure in which must sometimes be sufficient to force the main trap seals. The serious objections to numerous and adequate openings from the public sewers at the street level are well recognized, and such a means of securing free communication between street sewers and the outer air has been but rarely supplied.

A second objection to the omission of traps arises from the fear that the obstructing foreign matters now retained by the house trap would otherwise pass to the public sewers and cause stoppages therein This is a real objection, especially where the separate system is in vogue, but, from the point of view of most sewer designers, would be more than compensated for by the full ventilation of the public system, which would take place if traps were not required.

A third and principal reason for the retention of house traps is, that disease germs may be communicated through the main sewer from an infected house sewer to other house lines. We agree with a recent writer that "the air in sewers may at times be charged with malignant germs of disease," and that the "ventilation of the public system should be effected where the air would be least liable to be inhaled by the public" Is it not true that the least dangerous point for the discharge of such germs is above the house top and not at the ground level?

No authoritative statement as to how far dangers of this nature are real can be made without close observation of the operation and effect upon the public health of systems in which house traps have not been used Notable examples of this class are found in the towns of Davenport, Ia.; Corning, N. Y ; and Newton, Mass. So far as I have been able to learn, no objection is made practically to the operation of the drainage equipment in these towns

The main and recurring objection is to present practice, the closing of the main sewer and, in many cases, of a considerable portion of the house drain to the most direct and available means for thorough ventilation

It may be noted that the objection to open connection with these sewers has little force if the plumbing within each house thus connected has tight joints The present methods of inspections and tests of new plumbing work assure this result in most cities At all events, the integ

rity of the plumbing should be above suspicion, whether main traps are provided or not. If the houses are constructed of uniform height, as is usually the case in modern city blocks, or if they are isolated from each other, as in suburban localities, emanations from the soil pipe openings cannot injuriously affect the occupants of neighboring premises.

In two outlying districts of the city of Washington the concurrence of three conditions, viz., new and clean sewers, recently constructed house plumbing, and the separated location of the dwellings, has been thought to justify the omission of the house running traps.

That even more radical opinions than those here expressed are entertained by eminent sanitary authorities is evidenced in a report to the Sewerage Commission of the city of Baltimore, rendered in November, 1896, by Messrs. Rudolph Hering and Samuel M. Gray, from which I quote:

"The problem of sewer ventilation resolves itself into a provision for maintaining a direct communication between the air in the sewers and the atmosphere, and in causing the entrance of pure air, and its circulation through the sewers, to be as free as practicable. The most perfect way to accomplishing the above condition is to ventilate the public sewers through the house drains and soil pipes of the buildings, to omit a main trap along the house sewer, which also acts as a retainer of foul matter, and to have perforations in the manhole covers of the public sewers. In this way an abundance of air can enter the system, not only from the outfall, but through the manhole covers, and circulate through the sewers and out through every private sewer to above the roofs of the buildings. Such a method of ventilation, however, requires that the entire plumbing in the house is planned and constructed by responsible parties, so that the work will be first class. It is also necessary to have the house pipes tested after the plumbing is finished so as to be assured of tight joints. This method has been tried in several cities in our country and is the common one of the continent of Europe, but it is not the usual one in our country, for there is in the minds of many a fear that if the public sewer should be ventilated through the soil pipe of their house some danger might arise, through a leak in their own pipes, of contracting a disease, the germs of which are supposed to come from the public sewers.

"From experience in our country, and in Europe, these fears are not well founded, and there are no facts on record to justify them. On the other hand, advantages of a thorough draft through the house pipes are considerable, and keeps them much cleaner than where a trap is placed between the house and the sewer, thus disconnecting the two. It has been said that air coming out of soil pipes below windows of adjoining houses might cause offense, but offense could also be caused if there were a main trap and the house pipes were fouled, which they generally are not when used for ventilating the public sewers."

Atmospheric Moisture and Artificial Heating.*

BY W M WILSON, MILWAUKEE, WIS.

The importance of aqueous vapor as a constituent of our atmosphere was not exaggerated by Tyndall, when he startled the scientific world by the announcement that "the removal, for a single summer night, of the aqueous vapor from the atmosphere which covers England would be attended by the destruction of every plant which a freezing temperature could kill."

For a long time humidity, relative or absolute, has taken its proper place among the principal meteorological elements, and every meteorological service in the world maintains a series of observations of atmospheric moisture with the same care as that bestowed upon temperature, barometric pressure, or rainfall. The intimate relation existing between the aqueous vapor of the atmosphere and its precipitation in the form of rain or snow has inspired practical meteorologists with the hope that in the study of this element might be found the solution of the problem of rainfall, and possibly lead to more accurate results in forecasting its occurrence. But while the relation existing between the various forms of water is very close, a knowledge of the exact conditions which exist, in sufficient force to account for a downpour of rain, has eluded our grasp, and the results of the study of this element, so far as practical weather forecasts are concerned, have been principally negative.

From a medical point of view, however, the importance of the relative evaporative power of the atmosphere, in estimating the peculiarities of special climates and their effects upon the human organism, must be evident to all who are familiar with the physiological functions of the skin and lungs, and of the mucous membranes of the entire respiratory tract. Indeed, according to Dr. Albert Buck.

"For certain classes of invalids the prevailing humidity at a given place is a matter of more consequence than the temperature; more important than the mean temperature—nay, in the opinion of some authorities, a matter of more import than is the variability of temperature, be the variations of the latter never so frequent, never so great, and never so sudden and sharp in their onset."

The connection which subsists between the humidity of the atmosphere and its capacity for absorbing moisture from bodies, both animate and inanimate, with which it is in contact, is a connection of the closest possible description, but it is a deplorable fact that medical literature is almost entirely lacking in a scientific explanation of the effect of the different degrees of humidity upon the animal economy. There is abundance of empirical evidence of the efficacy of the conditions prevailing in the different portions of the world for the cure of catarrhal and pulmonary troubles, but whether the improvement which not infrequently follows a residence in Colorado or New Mexico is to be accounted for by the dryness of the climate, as is the popular impression, the elevation above sea level, the abundant sunshine, the new surroundings, or the outdoor life, or whether it is the result of a combination of all, physicians are unable to say with any degree of certainty. It is, however, generally admitted that while aridity and elevation may play an important part in the curative process, the efficiency of the climate in this respect does not depend on these elements alone, as equally good results are obtained from a residence at Torquay or Falmouth, on the south of England, which are among the most humid climates on the globe, and are elevated only a few feet above the level of the sea. Many believe that the results, so far as humidity is involved, which follow a residence at any place possessing special climatic conditions, are not so much due to the dryness or saturation of the atmosphere as to the comparative freedom from sudden or extreme changes in humidity, incident either to the natural climate or to the comparatively small range between the humidity prevailing inside the dwellings and that of the outside air.

We will assume that during the winter months the normal relative humidity over the more populous portions of the United States, especially east of the Missouri and north of the Ohio rivers, is 72 per cent., and that the average diurnal range is from 60 per cent. to 85 per cent., which, it is believed, fairly represents the conditions prevailing over the area named.

For the purpose of obtaining data upon which to base a comparison between the average external humidity and the prevailing conditions with respect to moisture found in business offices and living rooms, observations were carried on during the past winter in buildings heated by steam, hot water, and hot air, and it was found that the average relative humidity from steam and hot water heating, with an average air temperature of 72°, was 28 per cent., while from furnace heating it was as low as 24 per cent. Dr. Albert Barnes, of Boston, found that the relative humidity in his office building, with an air temperature of 72°, was 31 per cent., while Mr. Henry, in investigating the relative humidity in the Weather Bureau building at Washington, during March, 1896, found that, with an air temperature of 72°, the relative humidity was 32 per cent. From these observations, it is safe to assume that the average relative humidity in dwellings and offices, during that portion of the year which requires artificial heating, is about 30 per cent., or about 42 per cent. less than the average outside humidity and drier than the driest climate known.

The evaporative power of the air at a relative humidity of 30 per cent. is very great, and when the tissues and delicate membranes of the respiratory tract are subjected to this drying process a corresponding increase of work is placed upon the mucous glands in order to keep the membranes in proper physiological condition, so that Nature, in her effort to compensate for the lack of moisture in the air, is obliged to increase the functional activity of the glands, and this increase of activity and the frequent unnatural stimulation, induced by the changing conditions of humidity from the moisture-laden air outside to the arid atmosphere within our dwellings, finally results in an enlargement of the gland tissues, on the same principle that constant exercise increases the size of any part of the animal organism. Not only do the glands become enlarged, but the membrane itself becomes thickened and harsh, and, sooner or later, the surface is prepared for the reception of the germs of disease which tend to develop under exposure to the constantly changing percentage of humidity.

If the limitations of this paper allowed, it might be interesting to notice some remarkable cases which have come under observation where catarrhal troubles have been relieved and apparently cured by simply introducing sufficient moisture into the air to bring the conditions to something near the normal.

The economic side of the question is equally interesting, and has the special attraction of being more nearly capable of a mathematical demonstration. In a room in which the temperature is 72°, with a relative humidity of 30 per cent., the temperature of the wet-bulb is 54.5°. If a room with a sensible temperature of 54.5° is considered comfortable—and there is abundance of evidence to show that the wet-bulb thermometer does not vary greatly from the sensible temperature under ordinary conditions—the same result can be attained by heating to only 60° and supplying sufficient moisture to raise the humidity to 70 per cent., which still conforms very closely to the normal condition of the outside air, so far as moisture is concerned. It would probably be impracticable to maintain uniformly a relative humidity of 70 per cent., especially with a low outside temperature, as the condensation upon the windows would be undesirable; but by heating to 65° the relative humidity could be held at 50 per cent. without any ill effects, except possibly on extremely cold days.

While no very accurate information is at hand as to the cost of heating at different temperatures, competent engineers estimate that about 25 per cent. of the cost of heating is expended in raising the temperature from 60° to 70°. If this be correct—and it is the best information obtainable at the present time—one fourth of the cost of heating could be saved by holding the temperature at 60° and raising the humidity to 70 per cent., still maintaining a wet-bulb temperature of 54.5°, the same as that obtained by heating to 72° under ordinary conditions. But to be conservative and avoid the possibility of any unpleasant results from condensation, our dwellings could be heated to 65° with a relative humidity of 50 per cent., and still save 12½ per cent. over the present cost. A practical test was made on a small scale during the past winter with a view to determining a comfortable sensible temperature and the possibility of maintaining the humidity at a constant percentage. A valve controlled by an electric current was attached to a steam radiator and the electric contact made through an ordinary hair hygrometer. By this means it was possible to steadily maintain the relative humidity at any point desired, but owing to lack of means of controlling the temperature, the experiment fell short of determining the exact temperature and humidity at which the most comfortable conditions prevailed. The recognition of the need of a larger quantity of moisture in dwellings heated by artificial means is not new, but the mechanical difficulties encountered in automatically introducing the moisture in sufficient quantities to accomplish the desired result, or of controlling the amount introduced, has largely deterred practical research in this direction. But it is hoped that these difficulties will be overcome, and at no distant day a humidifier will be as necessary an adjunct to every first class heating plant as a temperature regulator is at the present time.

* Read at the Convention of Weather Bureau Officials, Omaha, Neb., October 13-14, 1898. From the Proceedings

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According to the British Architect, which is pretty good authority, the difference between a bay and an oriel is explained as follows: "A bay window is a projecting window, or rather a projection pierced with window openings in its entire width and rising immediately from the ground, whether it is confined to the lower part of the building or carried up through one or more stories above the ground floor; by the latter a bay which does not descend to the ground." An oriel window, then, is any projecting window that does not run down to the ground, and in this it corresponds to the German terms, "Erker fenster" and "Bhor fenster," which are the only ones of similar import in any foreign language. This absence of a name for it is accounted for by the thing itself being scarcely known in the architecture of countries outside of the United States, Germany, Great Britain and her colonies. The oriel is a beautiful and valuable feature in architecture, and one which admits of a very great diversity of design, and also imparts much variety and liveliness of effect to a building, more especially if there be ground bays likewise, the two kinds of projection both harmonizing and contrasting with each other.

The "long bridge" across the Potomac at Washington, D. C., is soon to be torn down to give place to a modern steel structure to be erected by the Pennsylvania Railroad. As a historical structure this bridge is perhaps one of the best known in this country. During the civil war it was considered the connecting link between the North and the South, and was crossed by thousands of troops. The bridge was built in 1833 and has been many times repaired.

Those who have to build scaffoldings to protect the public during building operations should see that they are strong enough to carry any proper load, and foremen should see that their laborers do not pile up unreasonable weights of brick and stone on stagings. A shed built over a sidewalk in Fourteenth Street, New York, intended to protect passers-by from falling objects, gave way under the weight of several tons of brick, which had been gradually accumulating on it. Four persons were under the shed at the time; one was killed. The shed is said to have been strongly built, and it is probable that the laborers employed in the work on the adjoining building continued to empty hods of brick on the platform, without knowing or caring whether they were taken away for use or whether the load was becoming dangerous, until failure took place. In such cases, the determination of the responsibility for the accident is a difficult matter, but some one should be held to account —American Architect.

THE HARTMAN STEEL PICKET FENCE.

THE "Hartman" steel picket fence has been made for eleven years and is extensively used throughout the world for the protection and adornment of lawns, schools, parks, cemeteries, cemetery lots and public and private inclosures generally. Its high merits have been strictly maintained, and it remains to-day unrivaled in its combined strength, beauty durability and low cost.

It is made in seven heights and three sizes of rod, is

HARTMAN FENCE IN GROUNDS OF STATE CAPITOL, HARRISBURG, PA.

capable of several different constructions and of being erected on uneven as well as level surfaces, on stone walls or wood bases as well as in the ground, on wood posts and rail, or complete with steel posts and rail.

Any good mechanic can erect it properly by following the instructions given by the makers, the Hartman Mfg. Co., Ellwood City Penn.

SELF-FEED RIP-SAW.

J A FAY & Co., No. 297 to 317 West Front Street, Cincinnati, Ohio, have just brought out a new self feed rip saw.

The machine is designed for ripping material into parallel strips for planing mills, furniture, wheel, wagon, buggy, and piano-factories, car, railway, and locomotive shops, navy yards, arsenals, etc. The frame of the machine is made of iron, with plate sides and ends heavily ribbed

The saw-arbor is of steel, 1⅜ in. in diameter where the saw is applied, and is mounted in long connected bearings within the frame, by which it is always retained in line. The end of the arbor is so constructed that several saws may be used at one time if desired. The arbor pulley is placed between bearings on the out side of the frame, allowing belts to be used in either direction. The machine saws up to 22 in. in diameter, and will rip 23½ in. wide.

The feed is exceptionally strong, consisting of a feed shaft and toothed disk for feeding, and a shaft with either a fluted or smooth roll for discharging the material. These are mounted in a frame, with adjustment for regulating the pressure on the material. The entire feeding mechanism can be lifted out of the way when it is desired to use the machine as a hand-rip-saw.

Two speeds of feed, 85 and 115 feet per minute, are furnished. The table is 78 by 38 inches, and is made either of iron or wood. It is connected with planed stands, on which it rises and falls through the action of a screw and bevel gears operated by hand wheel. The adjustment is parallel as well as vertical, so that the table always remains perfectly level. The section around the saw is made detachable, so that heads for gaining, rabbeting, etc., or a series of saws for ripping several pieces at one time, can be used.

The fence of the machine is long, and is moved across the face of the table by hand levers, which instantly release, move, and lock it, or vice versa. An index gauge shows the distance from the saw at which it is set. Friction rollers are placed in the table just before and after the saw, to diminish the friction.

When desired a side-roll and bevel fence attachment for making siding can be furnished, which can be set to any angle and any thickness. The machine, when fitted with this attachment, makes a most desirable siding saw for proprietors of small shops who do not wish to have a separate machine for this purpose. The same attachment answers for light resawing

The J. A. Fay & Egan Co. have been awarded the largest space in the World's Fair at Paris of any American company and they expect to make one of the most elaborate displays of wood-working machinery that has ever been made by an American company. At the World's Fair in 1889 the company was awarded the "Grand Prix," together with the Medal of the Legion of Honor. This year they expect at least to hold their own, and, perhaps, surpass their showing of 1889 a showing for which they received the thanks of the French Government.

Damp-Resisting Paint.

THE damp resisting paint made by Toch Brothers, 468-472 Broadway, New York city, is not an asphaltum or coal tar compound, but a combination of elastic gums, which resists the action of moisture The paint can be spread very easily on any surface. If the coating be even, so that there are no blank spots through which water can trickle, no moisture will ever find its way to the surface

The paint saves the cost of furring outside walls. Stone, wood, or ironwork coated with the paint can be plastered within a day. The paint will not peel, blister, crack, or chalk. To any architect or engineer who desires to make a practical test, the firm will be pleased to send a liberal sample gratis.

Roman and Pompeian Brick.

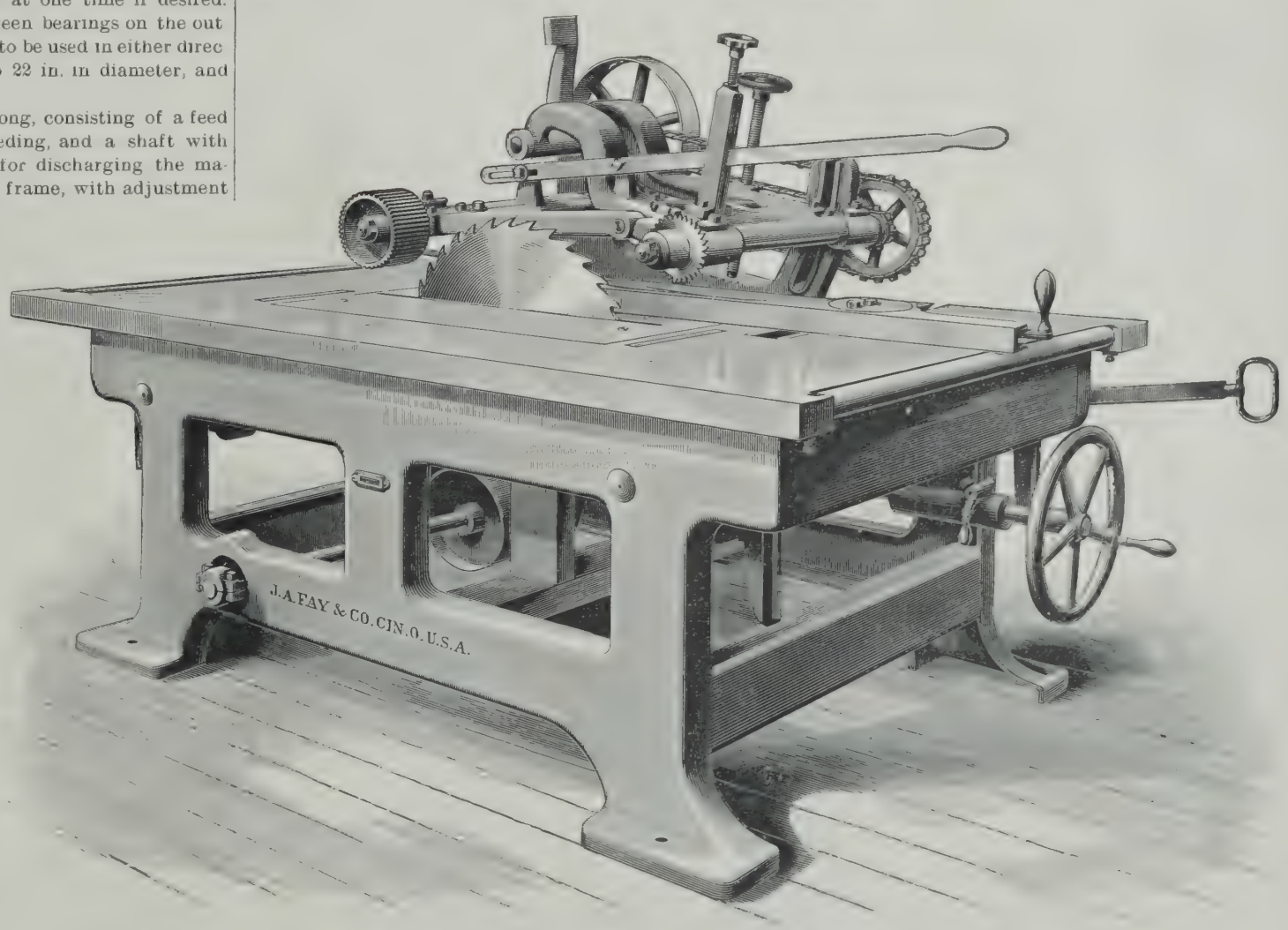
IN the former days when a brick was nothing but a red parallelopipedon of approximately uniform dimensions, there was no need of names to designate varieties of brick, but with the advent of the light-colored burnt clays several appellations have been evolved, some of them with sufficient pertinence to stick and become a part of our architectural nomenclature. Two of these which are most common are the designations Roman and Pompeian. The origin of these terms is very manifest, and the names themselves appropriate to the shapes they designate. The ordinary common brick is approximately 2 by 4 by 8 ins., and this shape has obtained pretty generally in the past through France, the Netherlands, England, and this country. In Italy and in ancient Rome, however, bricks were very frequently made in different shapes. In much of the work in the Colosseum the bricks were triangular slabs of terra cotta 1 to 2 ins. thick, and 8 ins. to a foot wide on each face, being laid side by side in courses with the points turned in to the wall, and backed up by and tied into a mass of concrete. Another very common form was 15 or 16 ins. square and not over 1½ or 2 ins. thick. These bricks laid up in the wall with very thick joints are found in much of the old work, and suggested the manufacture of a brick 12 ins. long, 4 ins. wide, and 1½ ins. thick, which form has found a great deal of favor in modern work under the name of Roman brick. As a matter of fact it is Roman only in appearance on the exterior of the wall as the old bricks were nearly square, but in a decorative sense the term fits very fairly. The term applies wholly to the shape of the brick, being entirely independent of color or material.

Texture, that indefinite quality which is so much sought after by our architects, is a marked feature of much of the old brickwork which has been exposed to stresses of weather Some of the old brickwork in Pompeii seems to have been made with a mixture of rather coarse volcanic sand or cinders in with the clay, which on burning would show black spots at irregular intervals over the surface. This is the prototype of what we to day style Pompeian brick, which presents an appearance of having scattered through it a lot of rather fine, thoroughly burned cinders, giving a speckled appearance to the exterior, which for some purposes is very pleasing. These bricks suggest a wall which has passed through a conflagration, the brick having an over-burnt appearance, such as might be expected of brick dug out of a city buried for centuries under the deposits of a volcano. As a matter of fact it would be hard to find many bricks in Pompeii itself which bear any close resemblance to the speckled bricks which now are designated by the name of that city Still the appellation is a fair one, and one which seems to fit the case, and has found sufficient favor to be considered as a permanence. The term applies wholly to the mottled, cinder-specked appearance, being entirely independent of shape or size.—The Brickbuilder

Architect's Hand-book on Cements.

WILLIAM WIRT CLARKE & SON, Baltimore, Md. This convenient hand book of nearly seventy pages is replete with formulæ and facts concerning cements and their various uses. Besides this it contains a list of all the cement manufacturers in the United States.

PROF. NUSSBAUM, of Hanover, has discovered that the plastering on the walls seriously affects the acoustic properties of a room. He finds that the best results are obtained by using pure gypsum that has been heated to a white heat.



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THE method of making sheet lead for tea packing in Formosa is most interesting. The lead is brought from Australia in pigs, and after being melted is poured between two large tiles, the required degree of thickness for the sheet being obtained by pressure by the feet. The sheet is afterward trimmed to suitable sizes and shapes for soldering.

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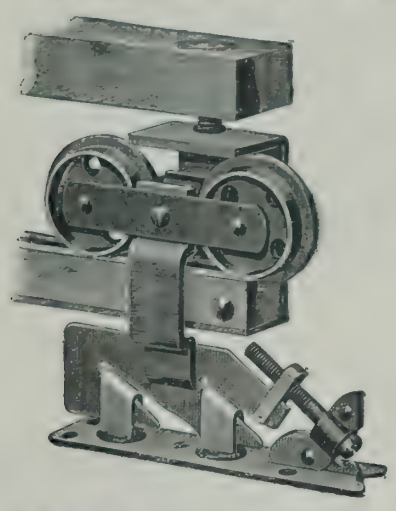

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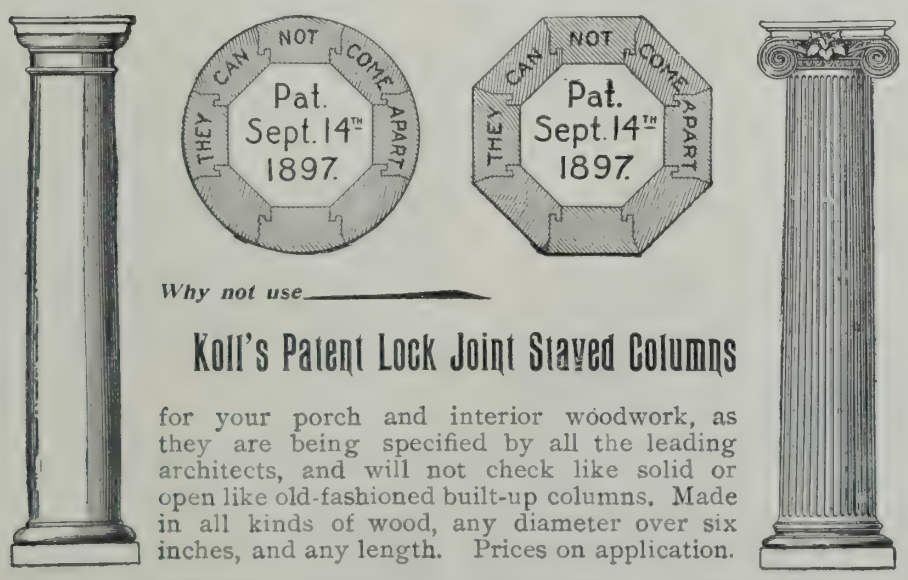

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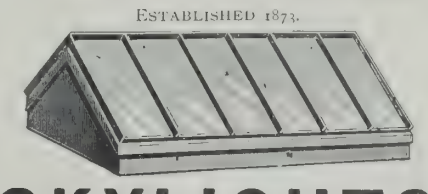

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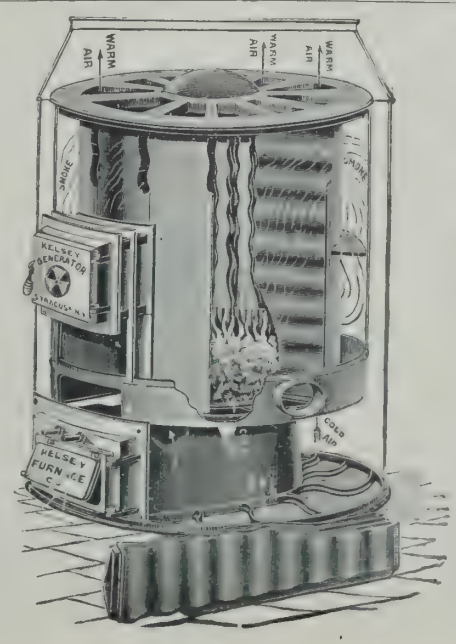

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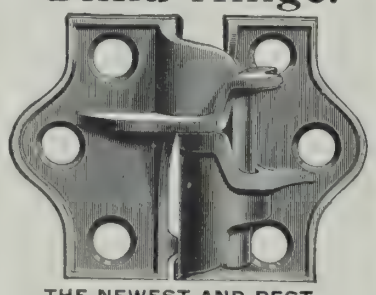

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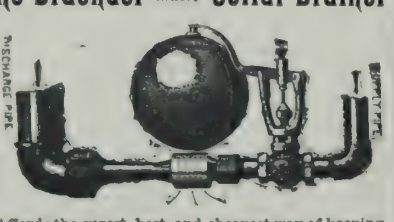

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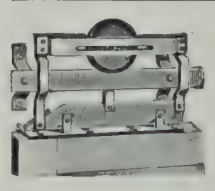

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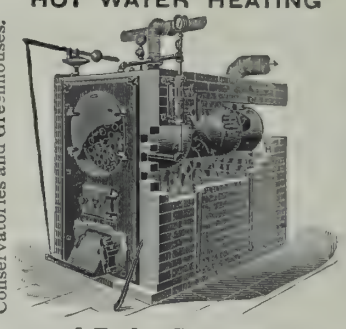

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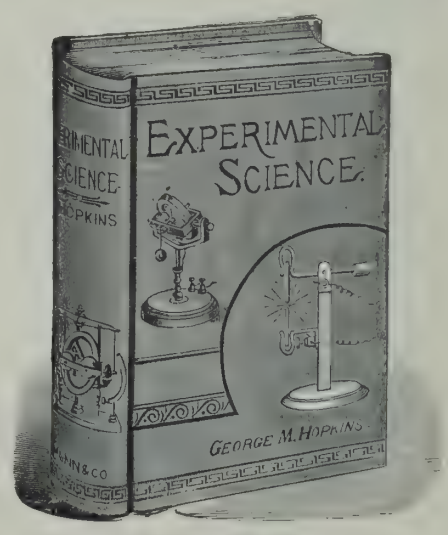

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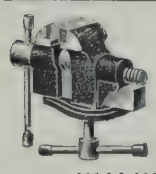

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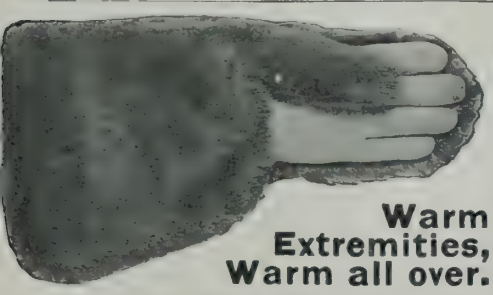

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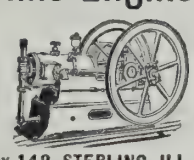

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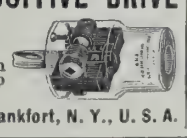

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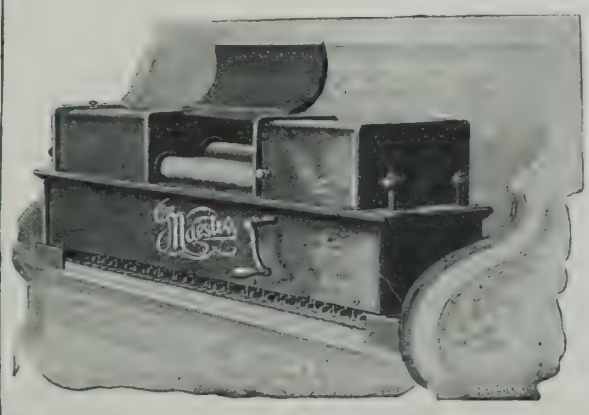

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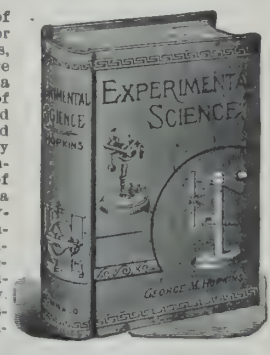

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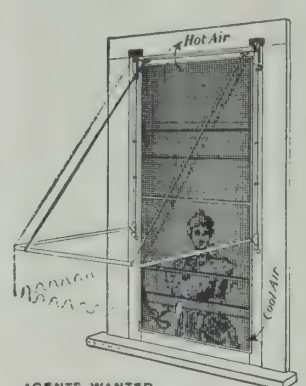

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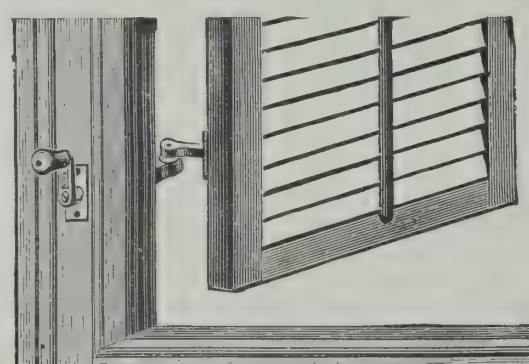

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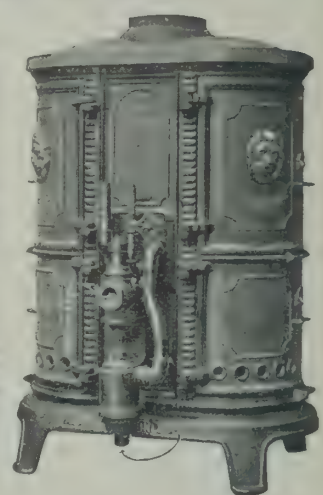

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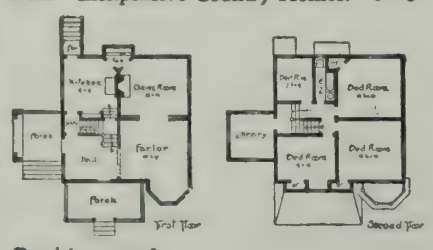

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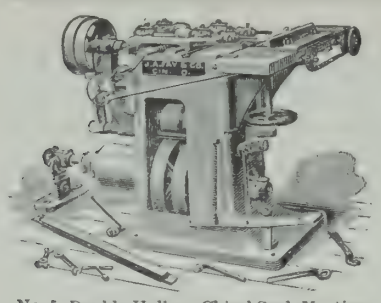

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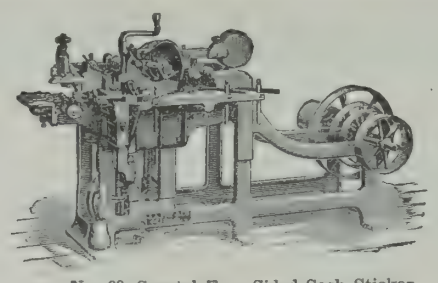

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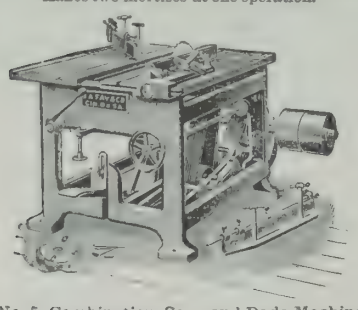

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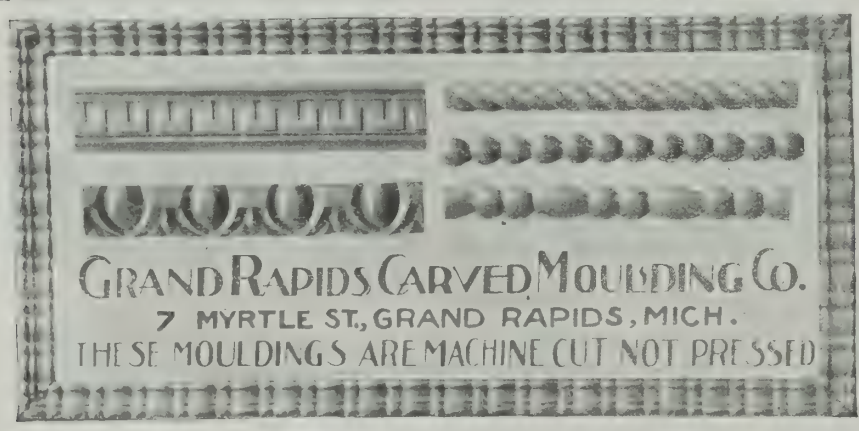

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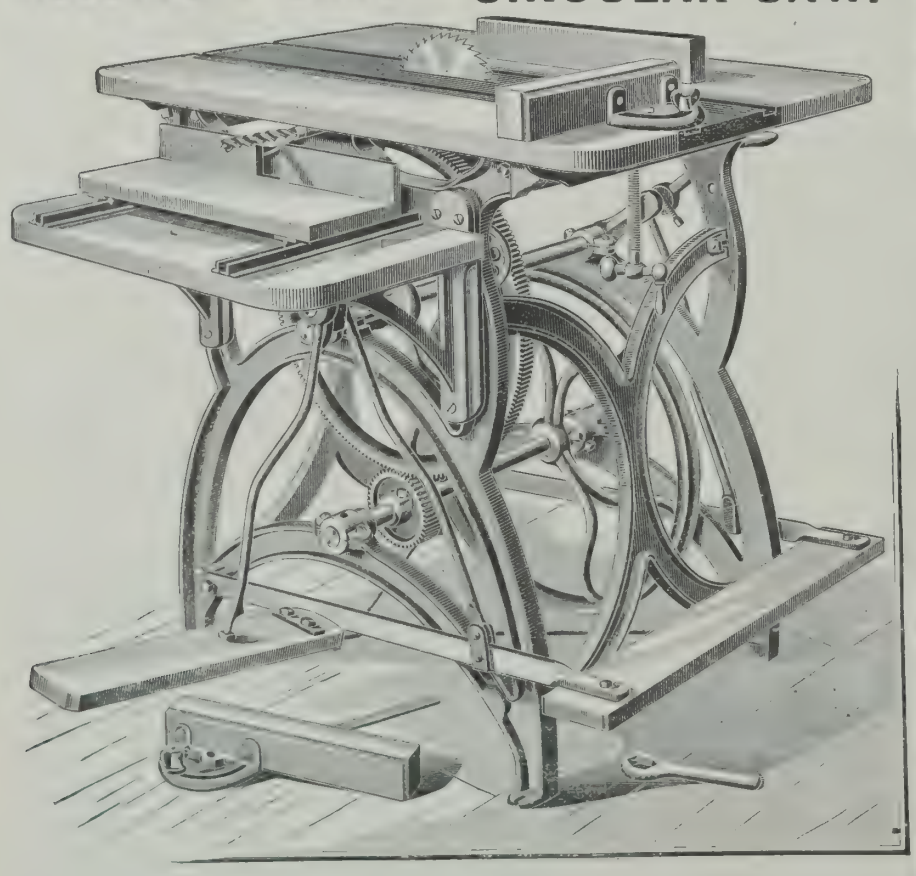

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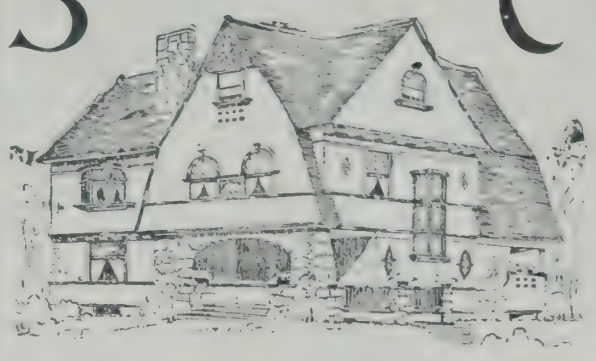

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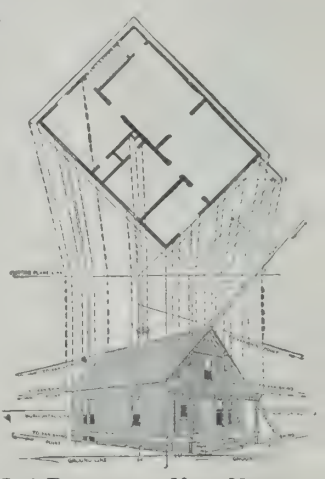

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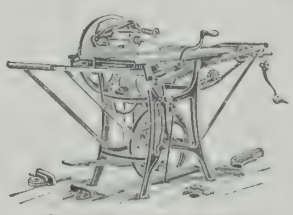

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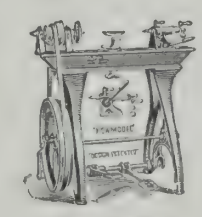

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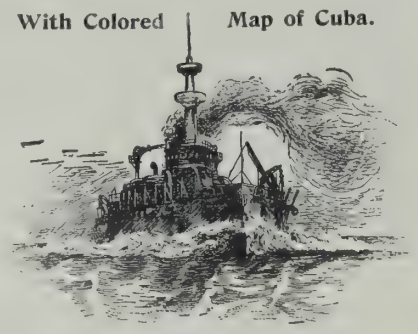

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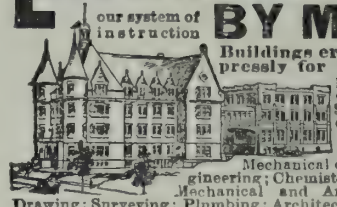

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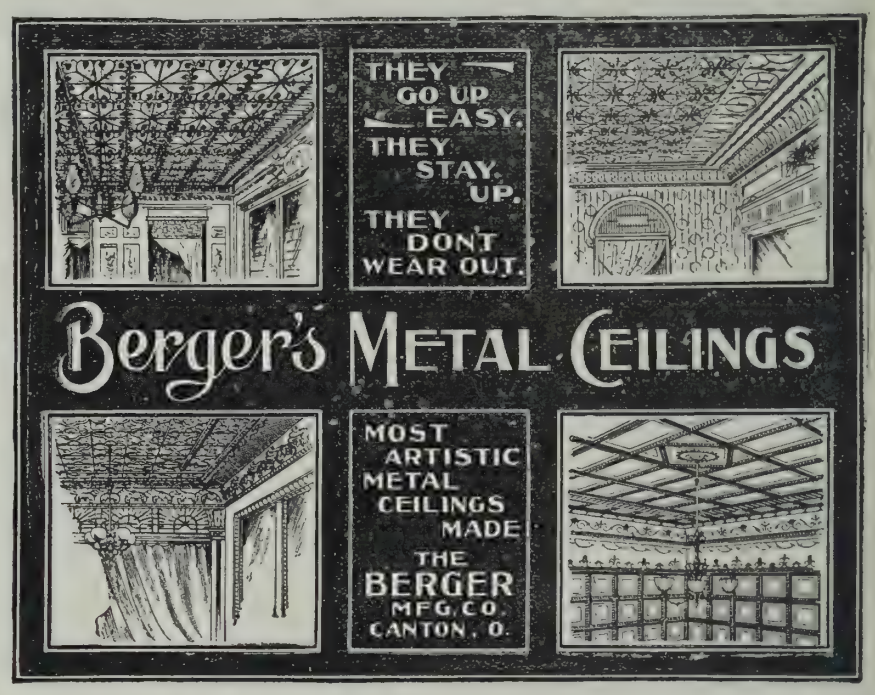

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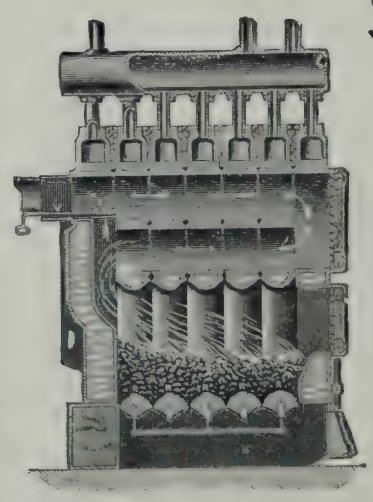

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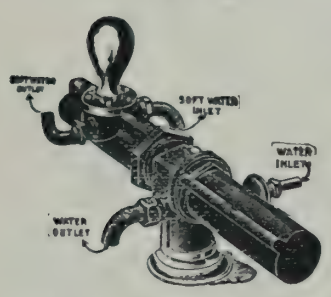

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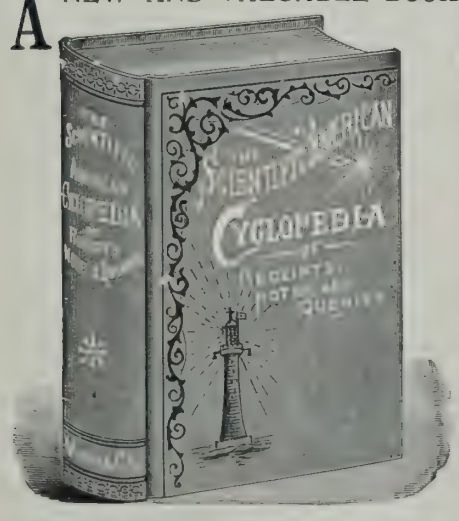

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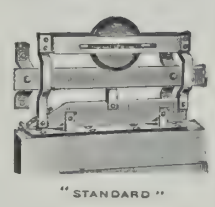
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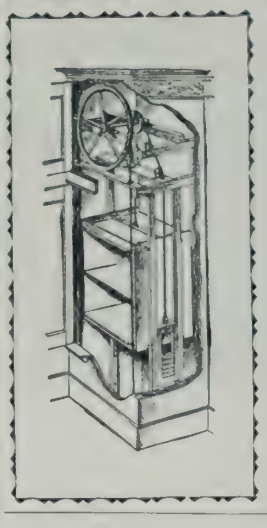

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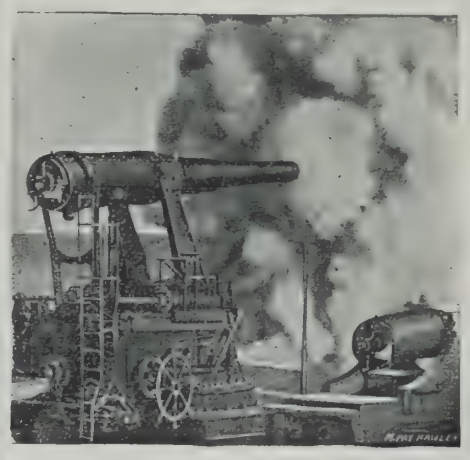

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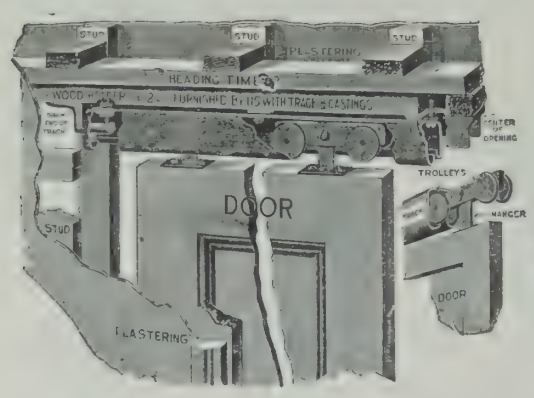

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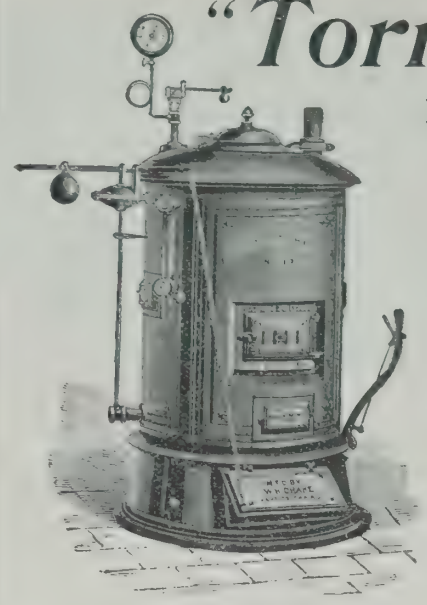

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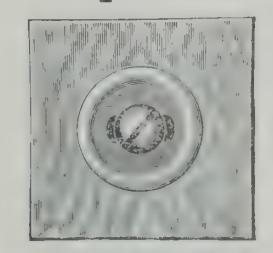

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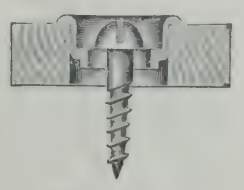

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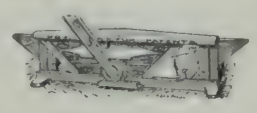

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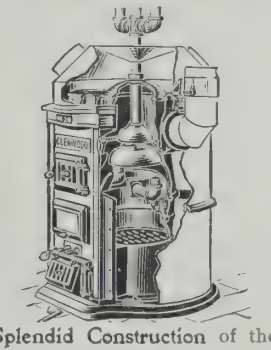

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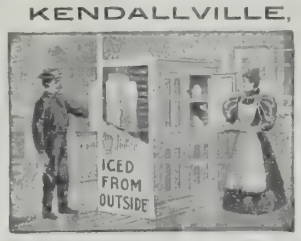

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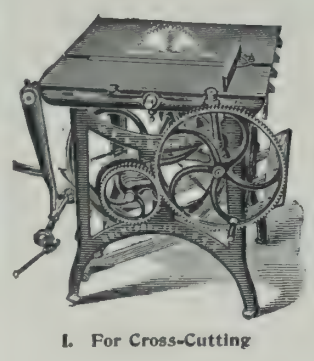

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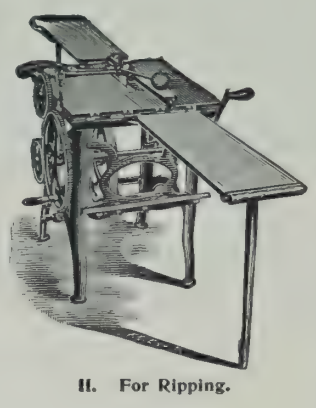

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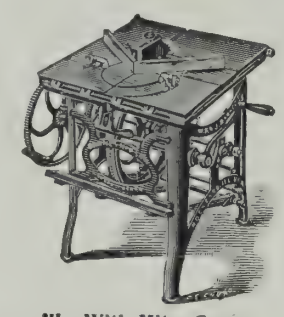

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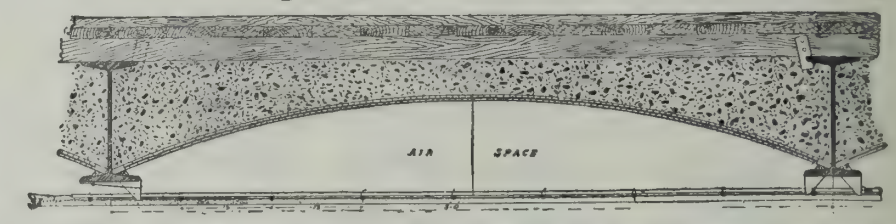

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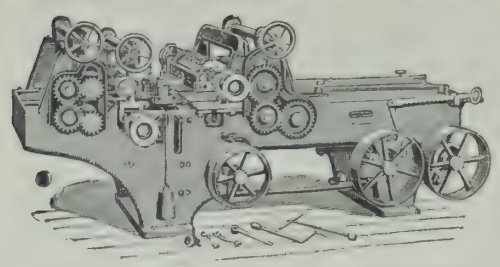

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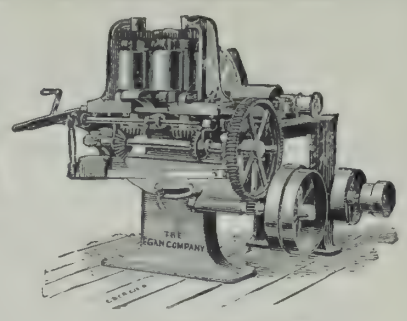

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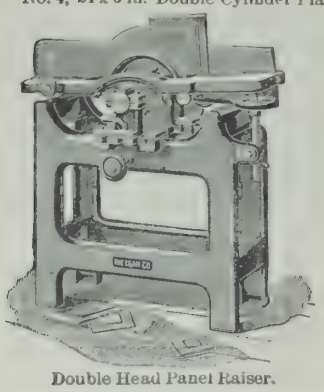

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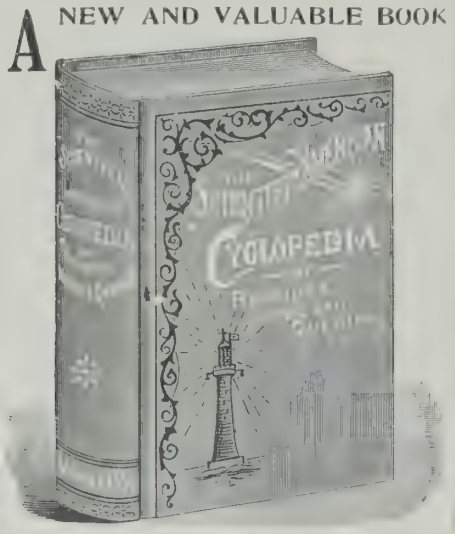

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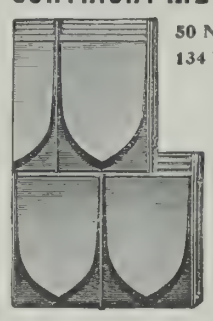

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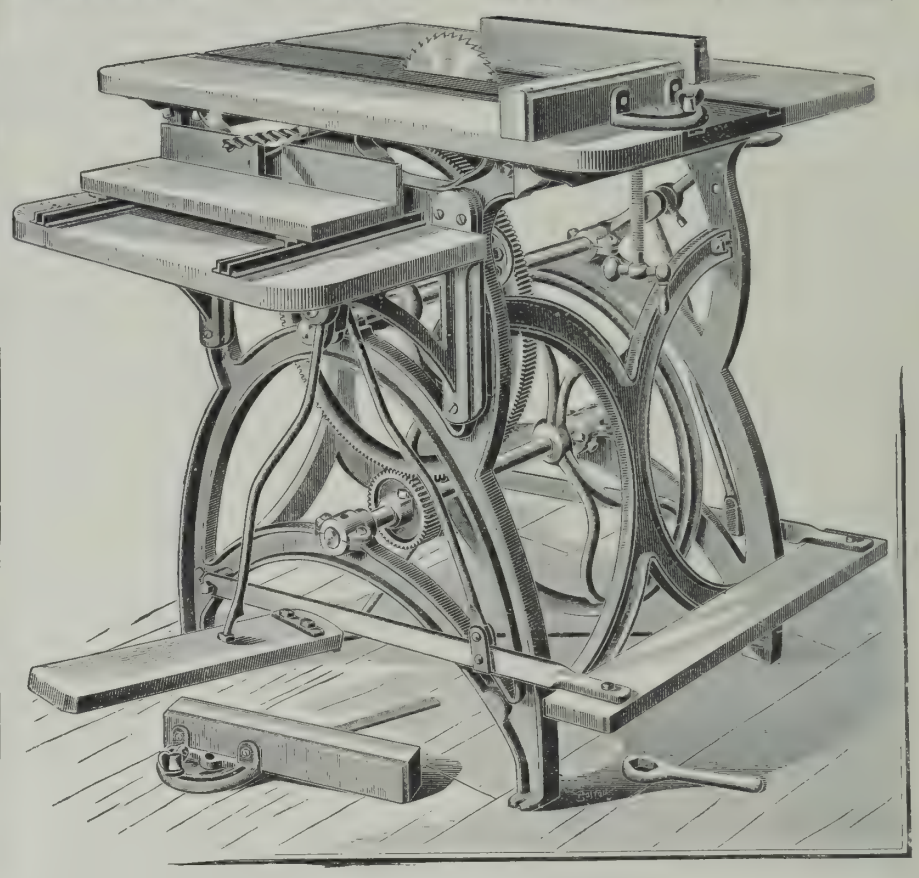

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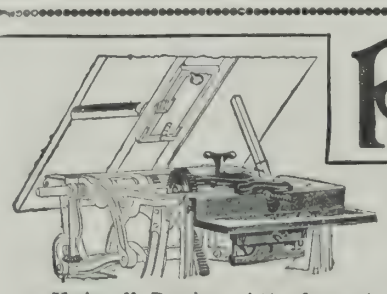

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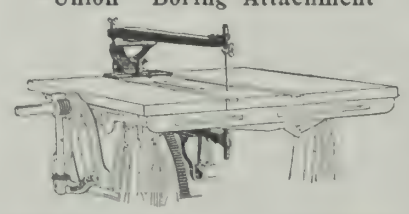

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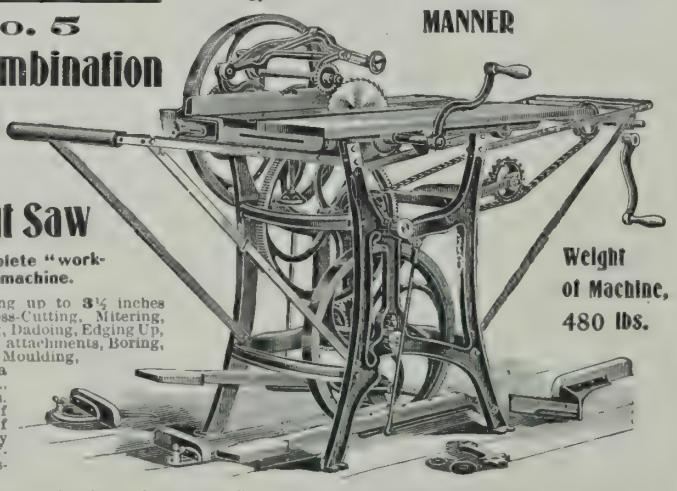

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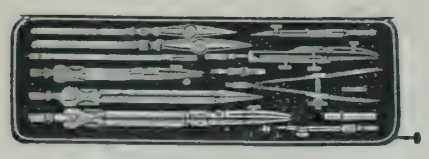

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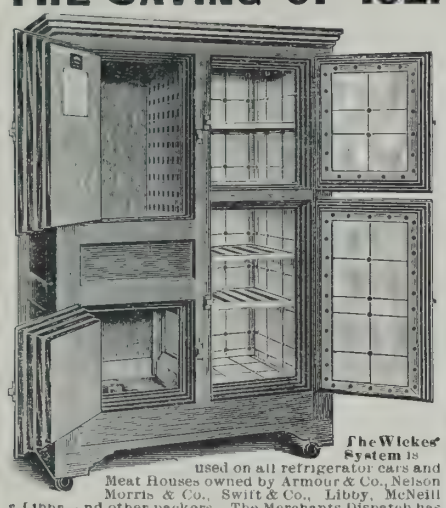

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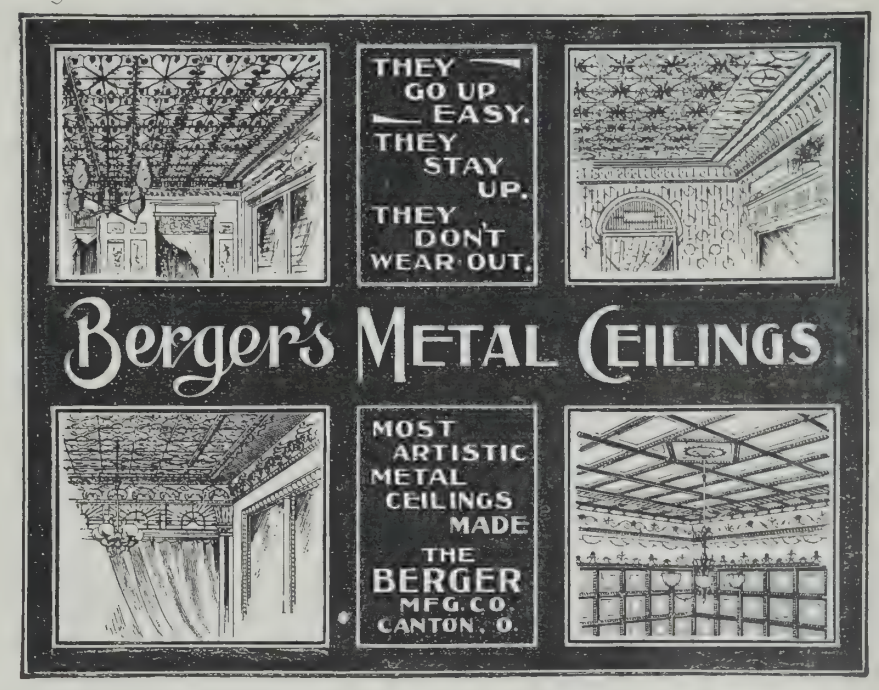

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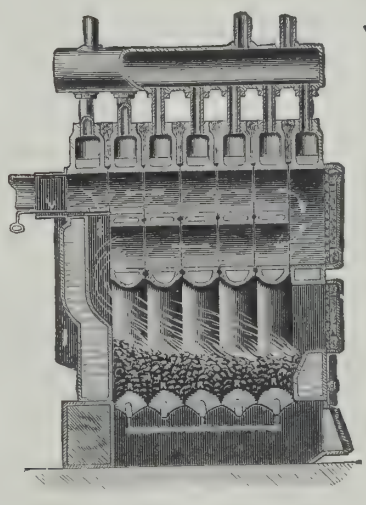

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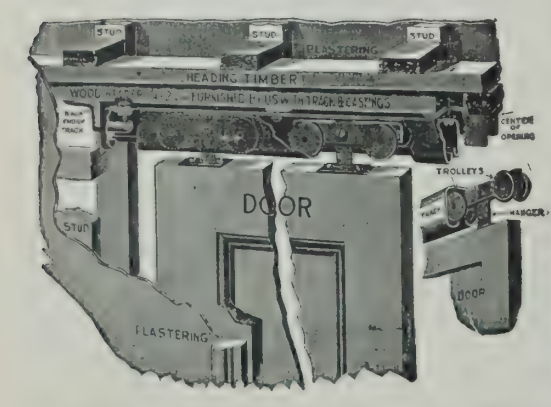

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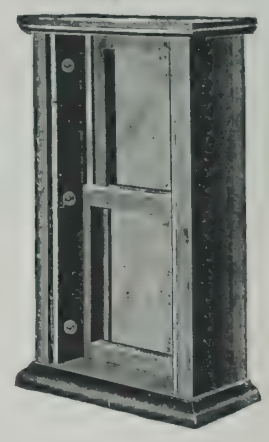

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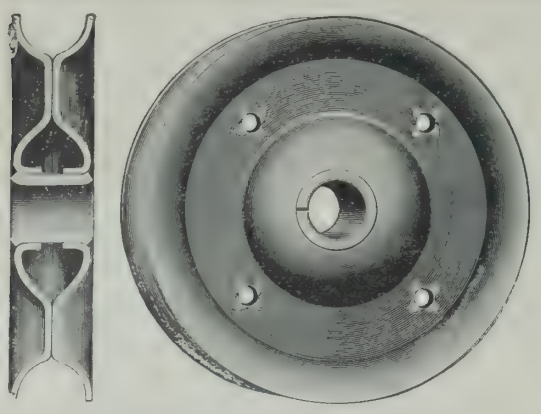

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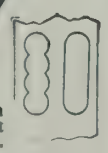

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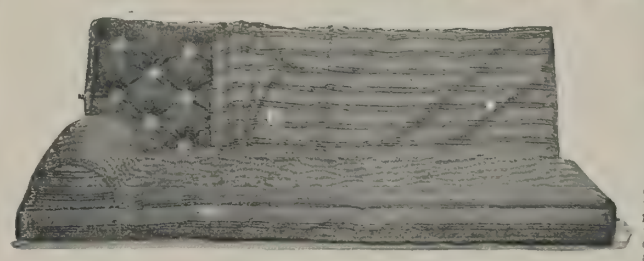

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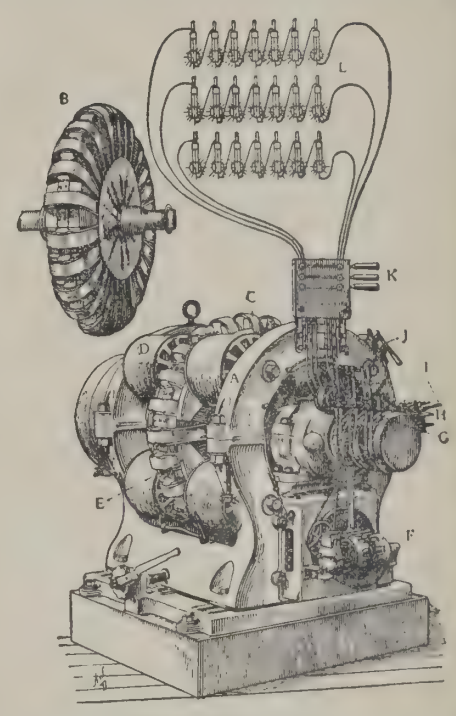

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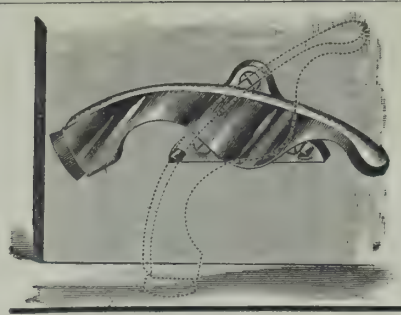

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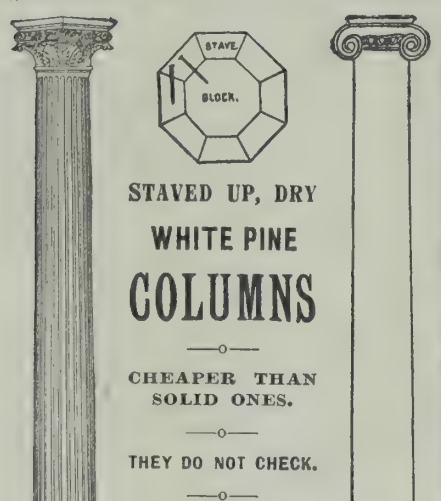

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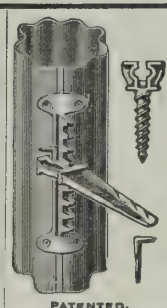

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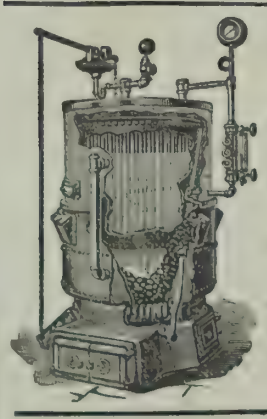

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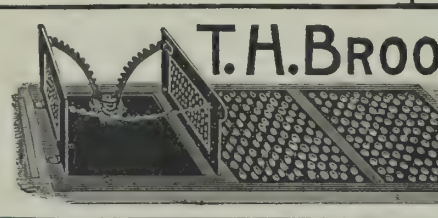

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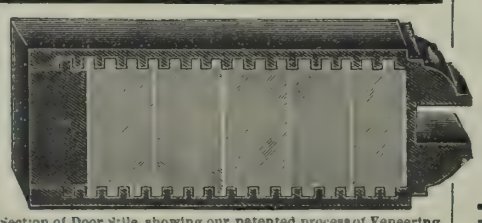

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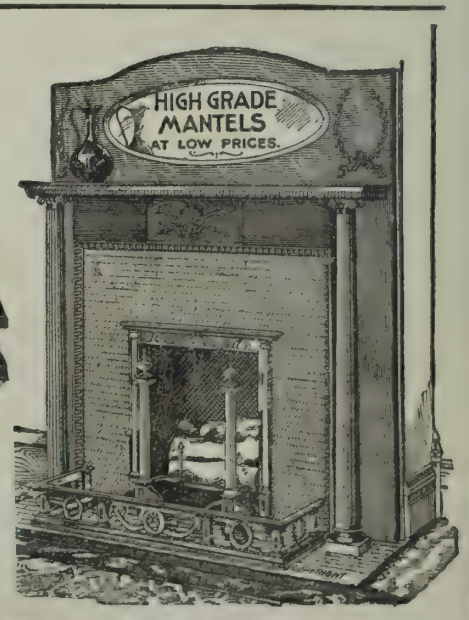

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